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FIFTH EDITION

Prepared by
Lynda Steele

February 1984

ENERGY DIVISION

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
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The following people contributed their time and skills in preparing this publication:

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MAJOR CHANGES IN THE FIFTH EDITION

Energy Consumption

The United States Department of Energy (DOE) publishes historical energy consumption data for each state in its *State Energy Data Report* series (EIA-0214). In this series, DOE uses fossil fuel equivalent conversion factors to convert kilowatt-hours of hydroelectric generation to British thermal units. Because so much of the electricity generated in Montana is produced at hydroelectric plants, DNRC feels that the use of these conversion factors results in an artificially high estimate of the amount of energy consumed in Montana. Thus, DNRC develops its own estimates of Montana energy consumption.

Sales to ultimate consumers, inflated to account for transmission line losses, are used to estimate the state's total electrical consumption. The difference between this figure and the amount of electricity generated in Montana is used to estimate net interstate sales of electricity.

The difference between the amount of energy generated by both Montana-Dakota Utilities and the Pacific Power and Light Company in Montana and the amount of electricity each company sells in Montana is used to estimate these utilities' net Montana import/export of thermal electric power. These figures are added to the portion of Colstrip's generation committed to the Puget Sound Power and Light Company to estimate the state's net import/export of thermal electric power. The difference between the net interstate sales of electricity generated by all sources and that electricity generated by thermal electric plants provides an estimate of net interstate sales of hydroelectric power. (These calculations make the artificial assumption that one can distinguish thermal electric kilowatts from hydroelectric kilowatts.)

Based on these estimates, DNRC calculates electrical consumption in Montana according to generation type—hydroelectric and thermal electric. DNRC's hydroelectric generation figures then are converted to British thermal units using 3,412 Btu/kWh rather than a fossil fuel equivalent conversion factor.

For purposes of comparison, both DNRC and DOE consumption estimates are shown in tables 1.3, 1.4, and 1.5.

Uranium

Due to a declining interest in Montana's uranium resources (as measured by the decline in the number of uranium prospecting permits issued in recent years), the fifth edition of the *Montana Historical Energy Statistics* no longer includes information on uranium resources.

Persons interested in such information should contact the Montana Department of State Lands or consult the DOE publication: *Statistical Data of the Uranium Industry, January 1, 1982,* GJO-100(82), U.S. Department of Energy, Grand Junction (Colorado) Area Office.

Changes in Tables

The *Montana Historical Energy Statistics* continues to move toward the exclusive use of "official" figures published by DOE. Where possible, the titles of the tables in this publication reflect the titles of the tables in the DOE source documents.

Due to changes in reporting, some previously Montana-specific data now are being reported by DOE only in aggregate form. (For example, some petroleum data are being reported by PAD (Petroleum Administration for Defense) district and some coal data are being reported by combined coal mining districts.) DNRC felt these data in their aggregate form were misleading and did not accurately reflect the situation in Montana. For this reason, DNRC has decided to discontinue publication of these data series. As a result, some tables appear in this publication for the last time.

Other data series appear for the last time because the agency collecting the data has decided to discontinue the series; for example, beginning in 1984 the Federal Reserve Bank of Minneapolis will no longer collect information on electrical consumption by Standard Industrial Classification (SIC) code.

In the three years since the *Montana Historical Energy Statistics* was last printed, DOE has altered definitions and reporting requirements. Thus, some data series can no longer be compared from year to year. Tables for such data series now are presented in two parts; data within the separate parts of each table are comparable, although the data in one part of the table can not be compared with data appearing in the other part of the table. Future editions of this publication will show only the revised reporting format. The reader should refer to the source documents for a detailed explanation of changes in definitions and reporting requirements.

Changes in Graphs

Some graphs in the *Montana Historical Energy Statistics* have been redrawn on the basis of historical data series from the "official" DOE source publications. Also, several graphs that appeared in previous editions were omitted from this edition because they may have been misleading; this is particularly true of crude oil and natural gas graphs in previous editions. Because the import/export situation for crude oil, refined petroleum products, and natural gas is complicated, and because DNRC's Oil and Gas Conservation Division is aware of inadvertent underreporting of imports and exports by certain firms, past graphs showing oil and gas import/export-dependent data oversimplified fuel movements and consumption.

Additions

This edition of the *Montana Historical Energy Statistics* includes typical electric power bills and average natural gas bills to illustrate the change in prices paid by all user sectors over the past few years.

Also, to reflect a growing interest in gasohol as a motor vehicle fuel, this publication now includes data showing the number of gallons of gasohol sold in Montana.

Brief definitions of the terms used in this publication appear in the Glossary beginning on page 77. All major DOE publications include extensive glossaries. If, however, none of these glossaries answers a particular question, the reader should refer to the source documents or contact the Energy Division for assistance.

NOTES REGARDING THE DATA

The *Montana Historical Energy Statistics* is a compilation of energy reserves, sales, consumption, and production data gathered from state, federal, and private sources. In some instances, two sources may show markedly different figures for basically the same data item. Such discrepancies are the result of differences in data collection methods and reporting procedures. The *Montana Historical Energy Statistics* recognizes that these differences exist, but, in general, does not include explanations for the differences. Readers needing detailed explanations of the definitions, data collection methods, etc., should refer to the original data sources or contact the Energy Division for further explanation.

Sales of energy products do not necessarily indicate consumption of those products. Some forms of energy may be added to storage facilities during the reporting period, causing sales to exceed consumption. Similarly, actual consumption may exceed sales if stockpiles are reduced by withdrawals from storage.

When DOE changes its reporting procedures or estimation methods, data from previous years are often revised to provide a time series of reasonably comparable data. For the purposes of this document, individual figures or years of data have been revised according to the most recently published information. In most cases, however, these revisions are not noted in the tables.

In some cases, individual data entries do not add to the printed totals. This can occur when the individual items have been rounded independently of the totals, or when the totals are based on unpublished revisions of the individual entries. (For example, many federal publications are published both monthly and annually, but the annual figures reflect unpublished additions, corrections, and revisions to the monthly data.) In such cases, the reader should consider the individual data entries indicative of the measurement in question rather than definitive.

DOE source publications often change the units in which data are reported; for example, DOE may change from reporting natural gas in *millions* of cubic feet to *billions* of cubic feet. Rather than revising the entire data series to reflect such a change, the *Montana Historical Energy Statistics* generally retains the original reporting units, appending zeros as necessary. For this reason, trailing zeros in figures should be considered place holders rather than significant digits.

When a source is cited with the name of an office, bureau, or company without reference to a particular publication, special tabulations were provided to DNRC.

The Glossary beginning on page 77 includes brief definitions of the residential, commercial, industrial, transportation, and electric utility end-use sectors developed by DOE. These sector definitions are not necessarily the same as those used by private organizations, utilities, etc. Also, because sector definitions vary and because customers are likely to change sectors over the years, the reader is cautioned against casual data comparisons between sources or over extensive periods of time.

Comments, corrections, suggestions, and requests for assistance as they apply to this publication should be addressed to the Energy Division, Department of Natural Resources and Conservation, Capitol Station, Helena, Montana 59620; telephone (406) 444-6697.

RELATED READING

Although the *Montana Historical Energy Statistics* presents data on Montana's energy reserves, sales, production, and consumption, it does not discuss their importance to the nation as a whole or the factors that influence these trends. Readers are referred to the following DNRC publications for further information.

The *Montana Natural Gas and Petroleum Review* (May 1983) analyzes the structure and operations of the oil and natural gas industries in Montana with respect to market trends and the major regulations that govern these markets. The report presents a general overview of the state's oil and gas production, transportation, and marketing operations. It is intended as a basic informational reference source as well as a foundation for understanding such issues as government deregulation and Montana's vulnerability to energy supply disruptions.

The *Montana Energy Almanac* (May 1983) provides information concerning Montana's energy legislation, policies, and programs. It also contains summaries of: Montana energy production, consumption, and reserves; prospective energy development plans; and regional, federal, and private sector energy-related activities. The *Almanac* includes a map of Montana showing the location of hydroelectric and thermal electric generating plants, power transmission lines, oil fields, natural gas fields, refineries, pipelines, coal beds, and coal mines.

Copies of both publications are available nationwide through the Montana State Library's Interlibrary Loan program. Copies also are available at all Montana state document depository libraries and at most public libraries in Montana. A limited number of complimentary copies of these publications is available from the Energy Division, Department of Natural Resources and Conservation, Capitol Station, Helena, Montana 59620; phone (406) 444-6697.

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ENERGY PRODUCTION AND CONSUMPTION

HIGHLIGHTS

- Total production of energy in Montana was 748 trillion British thermal units (Btu) in 1982, down 96 trillion Btu from 1981. This drop was largely due to a decline in coal production.
- Coal accounted for most (65 percent) of the total energy produced in Montana in 1982. The rest of the energy produced was in the form of crude oil (23 percent), natural gas (7 percent), and hydroelectric power (5 percent).
- Montanans consumed 281 trillion Btu of energy in 1981 (the latest year for which figures are available). This is 10 percent less energy than was consumed in 1980.
- More than half of the energy consumed in Montana in 1981 was in the form of petroleum products. Petroleum products accounted for 53 percent of Montana's energy consumption. Consumption of petroleum products was followed by consumption of natural gas at 19 percent, coal at 18 percent, and hydroelectric power at 10 percent.
- Industry, including agriculture, represented the largest consuming sector. In 1981 industry consumed 41 percent of the nonelectric energy sold in Montana. Transportation, almost exclusively in the form of petroleum products, accounted for 40 percent of the nonelectric consumption. The residential and commercial sectors consumed 10 percent and 8 percent, respectively, of the nonelectric energy sold in Montana.
- Over one-quarter of the energy consumed in Montana was used to generate electricity for use in the other consumption sectors.

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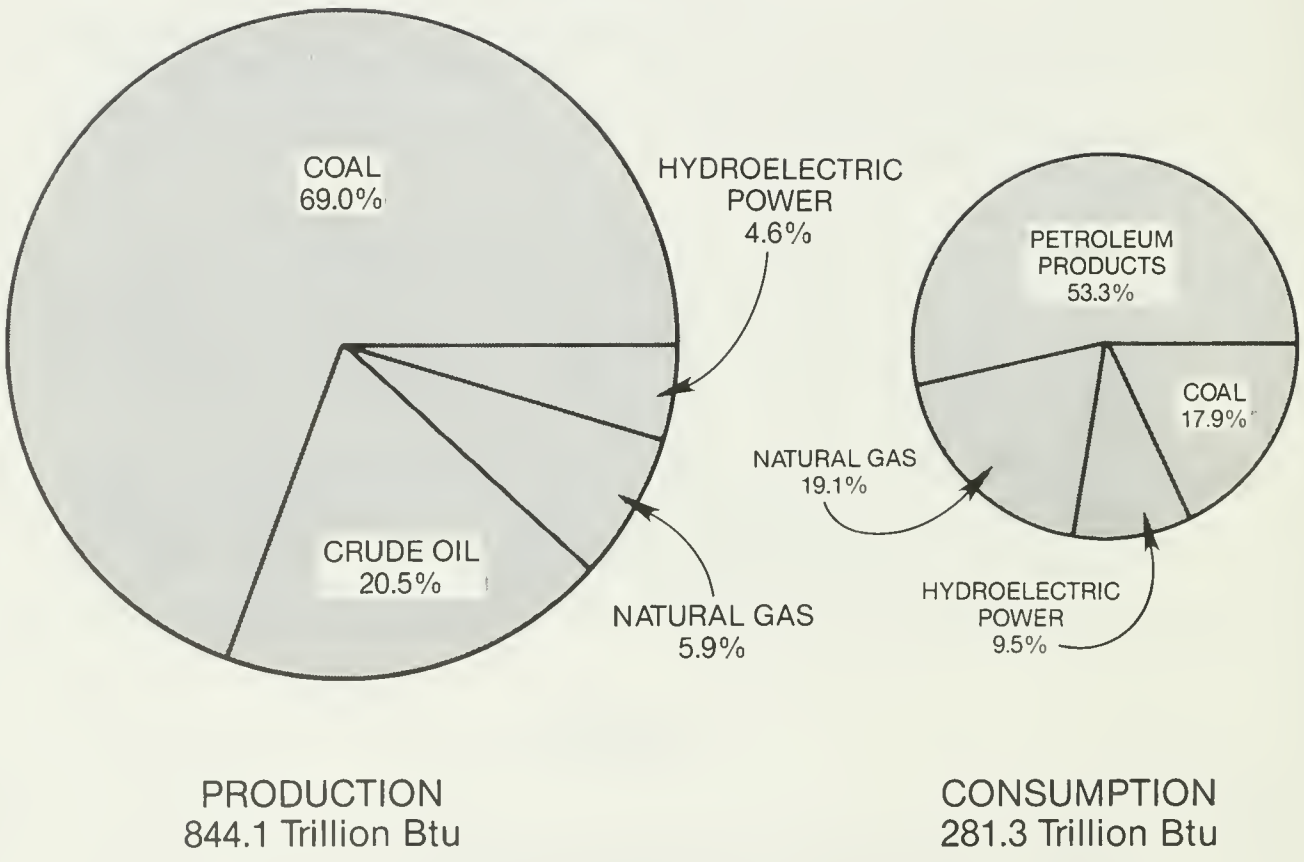

FIGURE 1.1 PRODUCTION AND CONSUMPTION OF ENERGY, 1981

NOTE: Fuels with negligible contributions to total production or consumption are not shown.

SOURCES: Production: Table 1.2.
Consumption: Table 1.4.

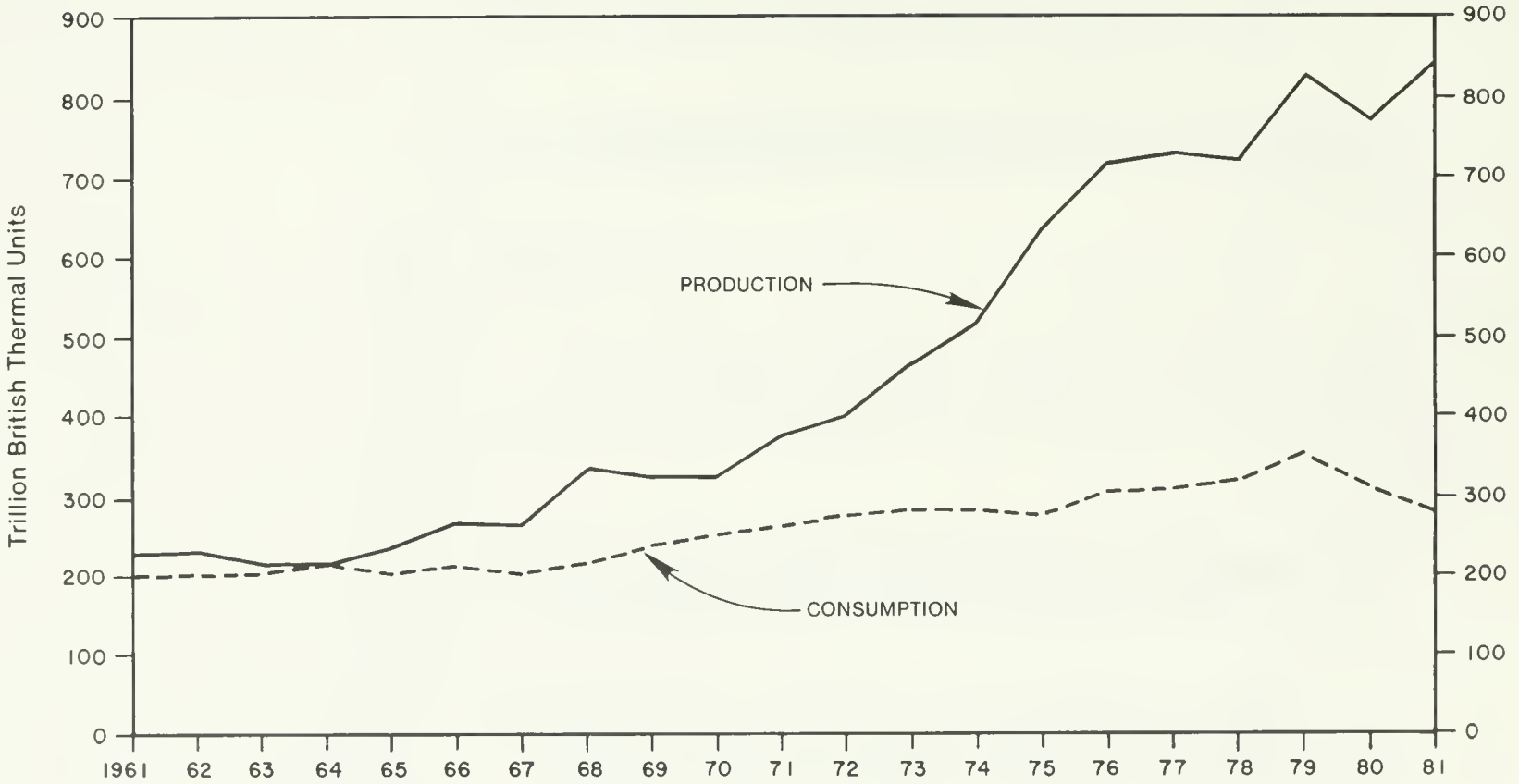

FIGURE 1.2 PRODUCTION AND CONSUMPTION OF ENERGY, 1961-81

SOURCES: Production: Table 1.2.
Consumption: Table 1.4.

TABLE 1.1
PRODUCTION OF ENERGY BY TYPE OF FUEL, 1960-83
(physical units)

Year	Subbituminous Coal (thousand tons)	Lignite Coal (thousand tons)	(Dry) Natural Gas (million cubic feet)	Crude Oil (thousand barrels)	Hydroelectric Power (million kilowatt-hours)	Wood & Waste[1] (million kilowatt-hours)
1960	113.000	200.000	35,381	30,240	5,801	NA
1961	97.000	274.000	34,884	30,906	6,499	0
1962	78.000	304.000	28,973	31,648	6,410	0
1963	53.000	290.000	27,113	30,870	6,011	0
1964	46.000	300.000	25,234	30,647	6,821	31
1965	63.000	301.000	27,873	32,778	8,389	37
1966	91.000	328.000	32,414	35,380	7,940	38
1967	65.000	300.000	31,619	34,959	8,703	56
1968	189.000	330.000	31,917	48,460	8,925	74
1969	722.000	308.000	41,229	43,954	9,447	61
1970	3,124.000	323.000	37,445	37,879	8,745	73
1971	6,737.000	327.000	38,137	34,599	9,595	60
1972	7,899.000	322.000	35,606	33,904	9,444	50
1973	10,411.000	314.000	58,896	34,620	7,517	48
1974	13,775.000	331.000	51,401	34,554	9,726	16
1975	21,620.000	520.000	44,546	32,844	9,560	14
1976	25,919.000	312.000	45,098	32,814	12,406	37
1977	27,091.013	302.426	48,181	32,680	8,460	46
1978	26,390.466	288.708	47,140	30,467	11,708	52
1979	32,148.549	305.143	53,888	29,957	10,344	52
1980	29,675.034	305.578	53,802	29,584	9,966	17
1981	33,127.167	204.492	50,073	30,813	11,324	34
1982	27,666.745	177.556	50,932	30,917	10,920	28
1983	28,453.741	206.543				

[1] Used to generate electricity.

NOTE: Because data on some fuels are not available, total production of energy may be slightly understated.

SOURCE: Coal: U.S. Bureau of Mines (1960-76); Montana Energy Office (1977); Table 3.2 (1978-83).
Hydroelectric Power and Wood and Waste: Table 2.2 (1960-82).
Natural Gas: Table 4.2 (1960-82)
Crude Oil: Table 5.3 (1960-82).

TABLE 1.2
PRODUCTION OF ENERGY BY TYPE OF FUEL, 1960-83
(trillion Btu)

Year	Subbituminous Coal	Lignite Coal	Coal Subtotal	(Dry) Natural Gas	Crude Oil	Hydroelectric Power	Wood & Waste	TOTAL
1960	1.978	2.600	4.578	35.381	169.646	19.793	NA	**229.398**
1961	1.698	3.562	5.260	34.884	173.383	22.174	0	**235.701**
1962	1.365	3.952	5.317	28.973	177.545	21.871	0	**233.706**
1963	0.928	3.770	4.698	27.113	173.181	20.510	0	**225.502**
1964	0.805	3.900	4.705	25.234	171.930	23.273	0.106	**225.248**
1965	1.102	3.913	5.015	27.873	183.884	28.623	0.126	**245.521**
1966	1.592	4.264	5.856	32.414	198.482	27.091	0.130	**263.973**
1967	1.138	3.900	5.038	31.619	196.120	26.695	0.191	**262.663**
1968	3.308	4.290	7.598	31.917	271.861	30.452	0.252	**342.080**
1969	12.635	4.004	16.639	41.229	246.582	32.233	0.208	**336.891**
1970	54.670	4.199	58.869	37.445	212.501	29.838	0.249	**338.902**
1971	117.898	4.251	122.149	38.137	194.100	32.738	0.205	**387.329**
1972	138.232	4.186	142.418	35.606	190.201	32.223	0.171	**400.619**
1973	182.192	4.082	186.274	58.896	194.218	25.648	0.164	**465.200**
1974	241.062	4.303	245.365	51.401	193.848	33.185	0.546	**524.345**
1975	378.350	6.760	385.110	44.546	184.255	32.619	0.478	**647.008**
1976	453.582	4.056	457.638	45.098	184.086	42.329	0.126	**729.277**
1977	474.093	3.932	478.025	48.181	183.335	28.866	0.157	**738.564**
1978	461.833	3.753	465.586	47.140	170.920	39.948	0.177	**723.771**
1979	562.600	3.967	566.567	53.888	168.059	35.294	0.177	**823.985**
1980	519.313	3.972	523.286	53.802	165.966	34.004	0.058	**777.116**
1981	579.725	2.658	582.384	50.073	172.861	38.637	0.116	**844.071**
1982	484.168	2.308	486.476	50.932	173.444	37.259	0.096	**748.207**
1983	497.940	2.685	500.626					

NOTE: This table gives the Btu equivalents of the physical units shown in Table 1.1.

TABLE 1.3
CONSUMPTION OF ENERGY BY TYPE OF FUEL, 1960-81
(physical units)

Year	Coal (thousand short tons)	Natural Gas (Dry) (billion cubic feet)	Petroleum (thousand barrels)	Wood and Waste[1] (million kWh)	DNRC: Estimated Instate Hydroelectric Power (million kWh)	DNRC: Estimated Net Interstate Sales of Thermal Electric Power Generation[2] (million kWh)	DOE: Hydroelectric Power (million kWh)	DOE: Net Interstate Sales of Electricity[2] (million kWh)
1960	253	56	18,530	0	4,716	NA	5,800	-3,143
1961	335	59	20,134	0	4,816	31	6,498	-5,247
1962	373	63	20,624	0	4,735	0	6,409	-5,252
1963	356	67	20,649	0	4,934	110	6,011	-3,264
1964	380	69	21,406	31	5,433	205	6,819	-4,144
1965	368	71	18,493	37	6,028	354	8,388	-6,955
1966	390	72	19,966	39	6,743	352	7,939	-3,201
1967	380	65	18,907	56	6,642	528	8,704	-5,800
1968	449	63	21,031	74	7,310	754	8,924	-4,142
1969	619	78	21,529	61	8,289	895	9,448	-2,573
1970	762	88	21,209	73	7,963	915	8,744	-1,220
1971	730	88	22,678	61	8,305	989	9,593	-2,563
1972	828	84	24,816	51	9,022	1,116	9,443	-2,362
1973	950	90	26,454	48	6,907	1,278	7,518	-256
1974	923	80	27,334	16	8,205	1,401	9,723	-2,518
1975	1,144	80	26,765	14	7,279	1,224	10,164	-6,007
1976	2,496	74	29,825	37	7,501	-1,383	12,400	-16,009
1977	3,381	71	28,966	46	7,009	-3,808	8,458	-8,381
1978	3,394	73	30,516	52	7,875	-3,808	11,706	-14,767
1979	3,686	70	34,723	52	7,815	-3,816	10,342	-11,932
1980	3,549	61	31,126	17	7,525	-4,181	9,963	-11,313
1981	3,615	52	26,488	34	7,859	-4,017	11,321	-15,024

NA Not Available.

[1] Consumed at utilities to produce electricity.

[2] Net interstate sales of electricity is the difference between the amounts of energy in the electricity sold within a state (including associated losses) and the energy input at the electric utilities within the state. The net interstate sales, therefore, include associated electrical energy losses. A positive number indicates that more electricity (including associated losses) came into the state than went out of the state during the year. Conversely, a negative number indicates that more electricity (including associated losses) went out of the state during the year.

NOTE: Does not include wood consumed by the nonutility sectors. Also excludes small quantities of other energy sources for which consistent historical data are not available, such as solar energy obtained by the use of thermal and photovoltaic collectors, wind energy, and geothermal, biomass, and waste energy other than that consumed at the electric utilities.

SOURCE: U.S. Department of Energy, Energy Information Administration, *State Energy Data Report: 1960 through 1981* (EIA-0214). (DNRC columns calculated as indicated on page iv.)

TABLE 1.4
CONSUMPTION OF ENERGY BY TYPE OF FUEL, 1960-81
(trillion Btu)

				DNRC			DOE			
Year	Natural Gas (Dry)	Wood and Waste[1]	Petroleum	Estimated Instate Coal[2]	Estimated Instate Hydroelectric Power	TOTAL	Coal	Hydroelectric Power	Net Interstate Sales of Electricity[3]	TOTAL
1960	57.6	0.0	104.1	NA	16.1	**NA**	4.3	62.4	-10.7	**217.7**
1961	61.3	0.0	113.3	5.5	16.4	**196.5**	5.4	69.2	-17.9	**231.3**
1962	65.7	0.0	116.9	6.0	16.2	**204.8**	6.0	67.7	-17.9	**238.4**
1963	68.6	0.0	117.2	6.1	16.8	**208.7**	5.7	63.0	-11.1	**243.4**
1964	71.6	0.3	121.5	6.9	18.5	**218.8**	6.2	71.3	-14.1	**256.8**
1965	73.0	0.4	103.2	7.0	20.6	**204.2**	5.8	87.7	-23.7	**246.4**
1966	74.4	0.4	111.3	7.3	23.0	**216.4**	6.1	82.7	-10.9	**264.0**
1967	67.1	0.6	103.8	7.5	22.7	**201.7**	5.7	90.8	-19.8	**248.3**
1968	64.8	0.8	116.2	9.6	24.9	**216.3**	7.0	92.8	-14.1	**267.4**
1969	80.7	0.6	119.2	13.0	28.3	**241.8**	9.9	98.7	-8.8	**300.3**
1970	90.5	0.8	117.9	15.3	27.2	**251.7**	12.2	91.8	-4.2	**309.0**
1971	91.0	0.6	126.2	15.2	28.3	**261.3**	11.8	100.5	-8.7	**321.4**
1972	86.6	0.5	138.1	17.3	30.8	**273.3**	13.5	98.0	-8.1	**328.7**
1973	92.0	0.5	147.7	20.0	23.6	**283.8**	15.6	78.1	-0.9	**333.1**
1974	81.8	0.2	153.6	19.9	28.0	**283.5**	15.1	101.5	-8.6	**343.6**
1975	81.1	0.1	150.2	23.0	24.8	**279.2**	18.8	105.8	-20.5	**335.5**
1976	75.8	0.4	168.1	38.1	25.6	**308.0**	42.8	128.6	-54.6	**361.1**
1977	72.3	0.5	163.3	46.4	23.9	**306.4**	58.9	88.3	-28.6	**354.7**
1978	73.8	0.5	170.6	46.1	26.9	**317.9**	59.1	121.3	-50.4	**375.0**
1979	71.1	0.5	201.0	51.7	26.7	**351.0**	64.7	107.1	-40.7	**403.7**
1980	62.2	0.2	177.4	47.6	25.7	**313.1**	61.9	103.5	-38.6	**366.6**
1981	53.8	0.4	150.0	50.3	26.8	**281.3**	64.0	117.6	-51.3	**334.4**

NA Not available.

[1] Consumed at utilities to produce electricity.

[2] Net interstate sales of thermal electric power and the associated generation losses have been subtracted.

[3] Net interstate sales of electricity is the difference between the amounts of energy in the electricity sold within a state (including associated losses) and the energy input at the electric utilities within the state. The net interstate sales, therefore, include associated electrical energy losses. A positive number indicates that more electricity (including associated losses) came into the state than went out of the state during the year. Conversely, a negative number indicates that more electricity (including associated losses) went out of the state than came into the state.

NOTE: This table gives the Btu equivalent of the physical units shown in Table 1.3.

Does not include wood consumed by the nonutility sectors. Also excludes small quantities of other energy sources for which consistent historical data are not available, such as solar energy obtained by the use of thermal and photovoltaic collectors, wind energy, and geothermal, biomass, and waste energy other than that consumed at the electric utilities.

SOURCE: U.S. Department of Energy, Energy Information Administration, *State Energy Data Report: 1960 through 1981* (EIA-0214). (DNRC columns calculated as indicated on page iv.)

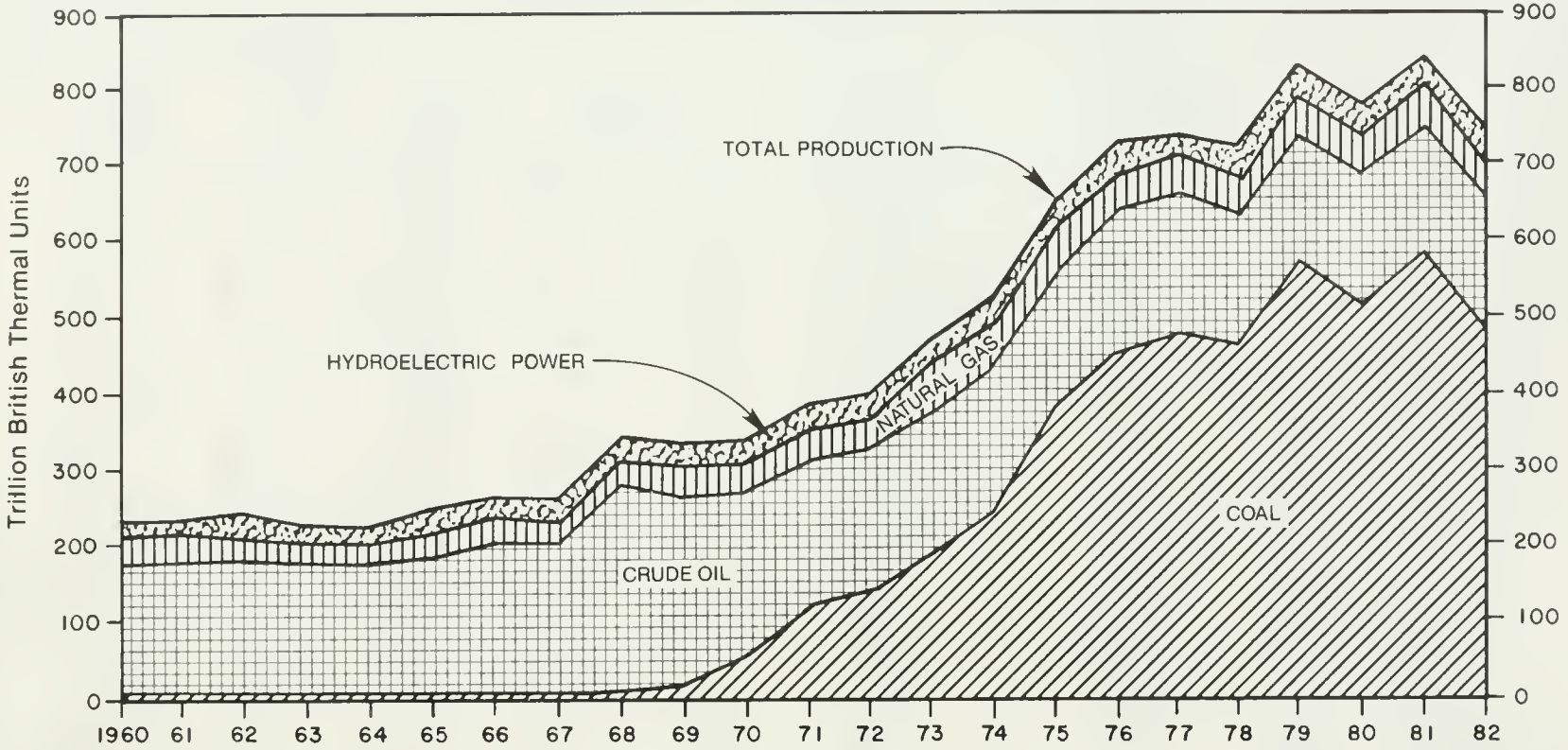

FIGURE 1.3 PRODUCTION OF ENERGY BY TYPE OF FUEL, 1960-82

NOTE: Wood and waste products used to generate electricity at electric utilities are not shown because their contribution is negligible.

SOURCE: Table 1.2.

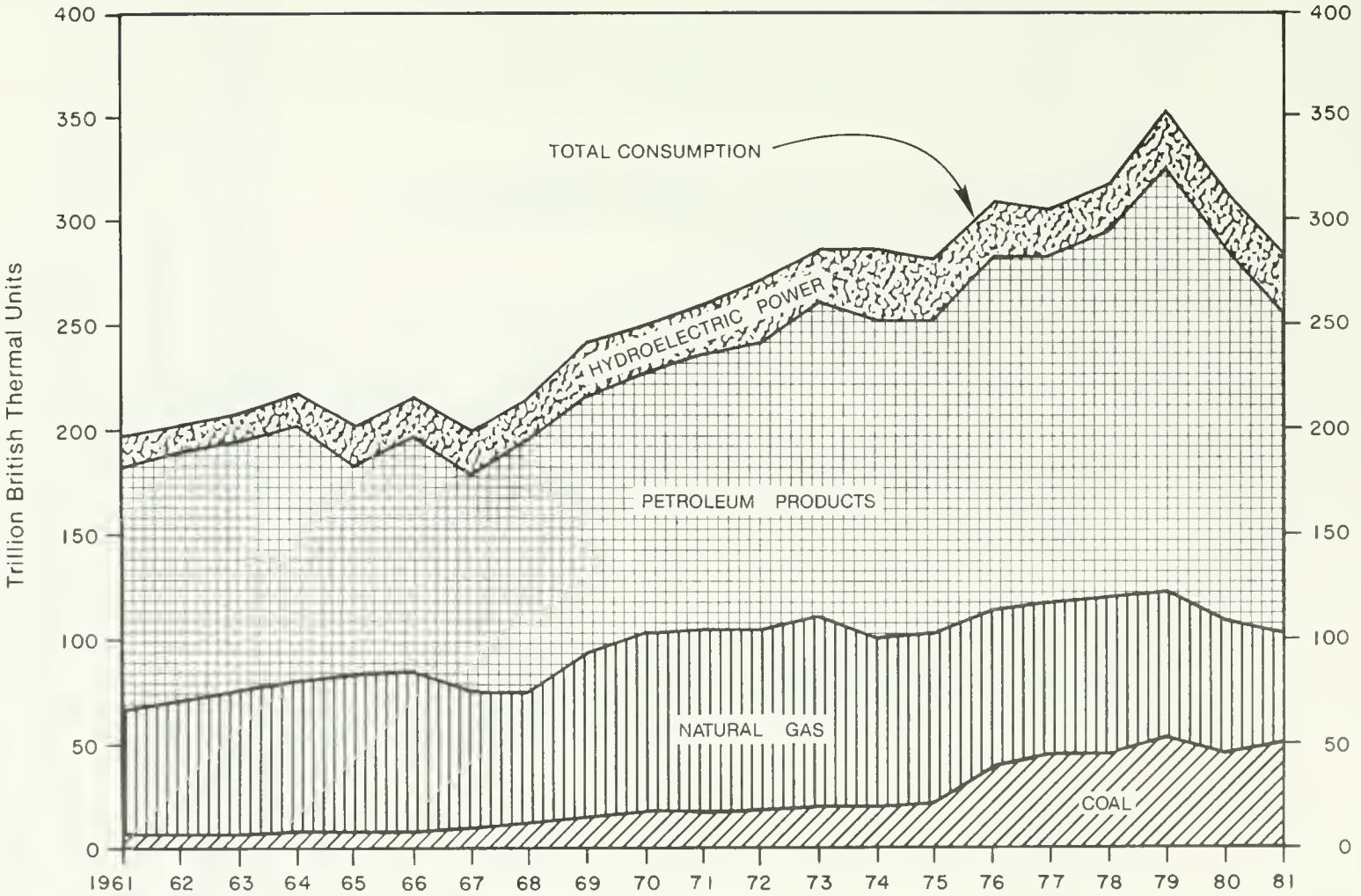

FIGURE 1.4 CONSUMPTION OF ENERGY BY TYPE OF FUEL, 1961-81

NOTE: Wood and waste products used to generate electricity at electric utilities are not shown because their contribution is negligible.

SOURCE: Table 1.4.

TABLE 1.5
CONSUMPTION OF ENERGY BY SECTOR, 1960-81
(trillion Btu)

Year	Residential (without electricity distributed)	Commercial (without electricity distributed)	Industrial (without electricity distributed)	Transportation (without electricity distributed)	DNRC		DOE	
					Electric Utilities[1]	TOTAL	Electric Utilities[1]	TOTAL
1960	21.3	18.3	66.6	57.0	NA	NA	54.6	217.7
1961	22.5	18.3	75.3	60.1	20.5	196.7	55.2	231.3
1962	22.2	18.1	81.5	59.1	23.9	204.8	57.5	238.4
1963	22.1	18.8	86.7	56.7	24.4	208.7	59.1	243.4
1964	24.2	20.9	91.0	56.8	26.0	218.9	64.0	256.8
1965	24.9	19.3	75.0	56.9	28.2	204.3	70.3	246.4
1966	25.3	18.5	78.6	61.6	32.5	216.5	80.1	264.0
1967	25.6	20.0	69.8	56.4	29.9	201.7	76.4	248.3
1968	26.0	18.1	76.1	61.4	34.7	216.3	85.9	267.4
1969	28.1	21.4	83.3	66.1	42.9	241.8	101.5	300.3
1970	30.5	23.3	84.9	68.0	45.0	251.7	102.3	309.0
1971	32.1	23.4	91.1	71.1	43.6	261.3	103.8	321.4
1972	31.2	24.8	93.2	75.6	48.4	273.2	103.7	328.7
1973	32.0	24.9	97.5	83.5	45.9	283.8	95.2	333.1
1974	29.2	22.5	99.1	85.2	47.5	283.5	107.6	343.6
1975	31.7	25.0	92.7	81.9	47.9	279.2	104.2	335.5
1976	31.5	24.3	101.9	88.1	62.1	307.9	115.2	361.1
1977	29.3	22.9	100.2	85.7	68.0	306.1	116.6	354.7
1978	32.0	24.6	94.2	97.3	69.6	317.7	126.8	375.0
1979	29.2	23.9	129.7	91.6	76.6	351.0	129.3	403.7
1980	25.4	17.9	107.9	88.7	73.2	313.1	126.7	366.6
1981	21.2	17.3	86.3	83.6	72.8	281.2	126.1	334.4

[1] Net interstate sales of electricity and the associated generation losses have been removed.

NA Not available.

NOTE: This table understates the true energy consumption in that small quantities of other energy sources for which consistent historical data are not available are excluded. Solar energy obtained by the use of thermal and photovoltaic collectors, wind energy, and geothermal, biomass, and waste energy (other than that consumed at the electric utilities) are not shown. Wood consumed by the nonutility sectors, such as wood burned for residential heating purposes, is not shown.

SOURCE: U.S. Department of Energy, Energy Information Administration, *State Energy Data Report: 1960 through 1981* (EIA-0214). (DNRC columns calculated as indicated on page iv.)

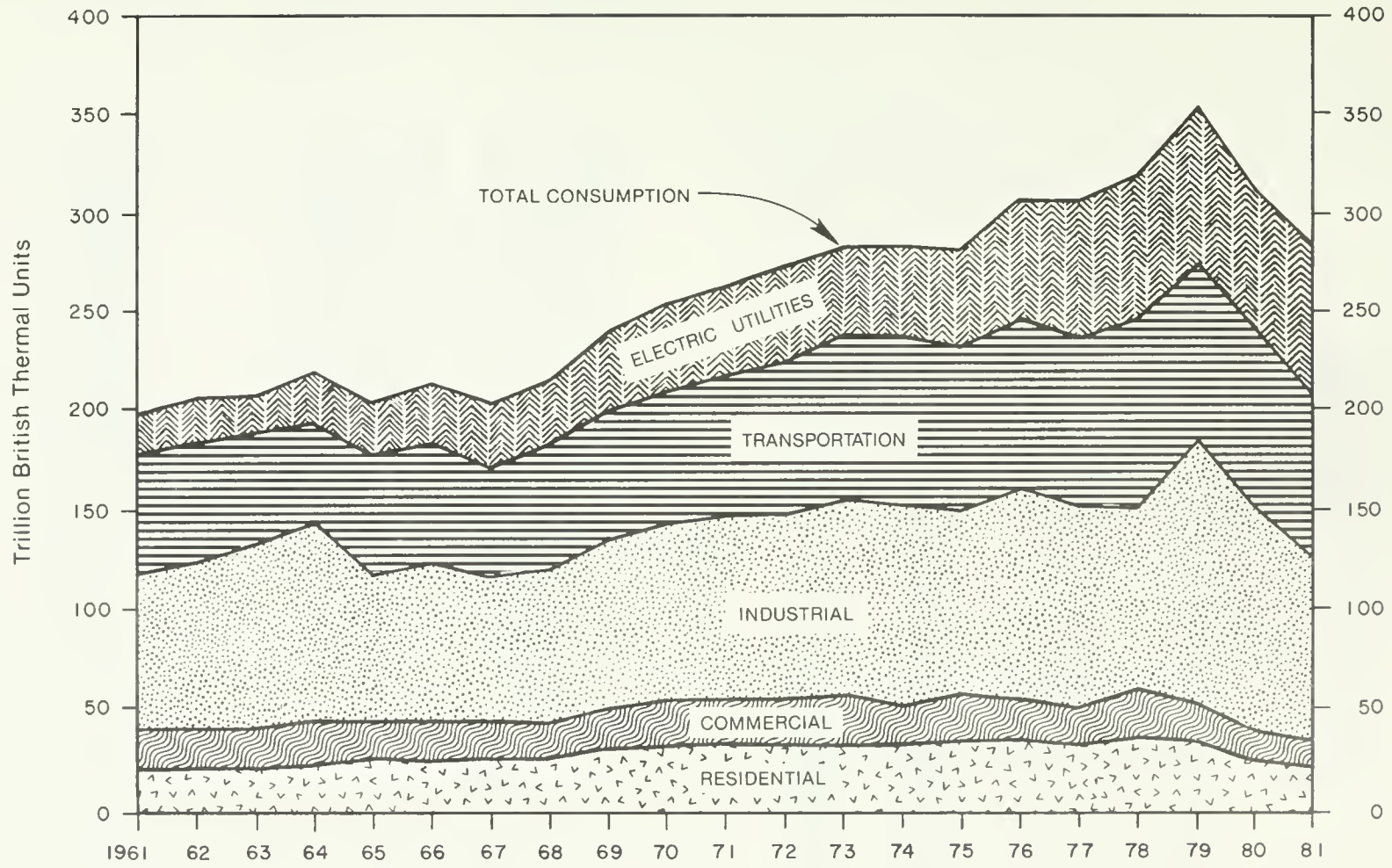

FIGURE 1.5 CONSUMPTION OF ENERGY BY SECTOR, 1961-81

SOURCE: Table 1.5.

2

ELECTRICITY

HIGHLIGHTS

- With the beginning of commercial operation of the third Colstrip unit in January 1984, total electric generating capacity in Montana jumped to 4,008 megawatts, of which 53 percent is hydroelectric generating capacity.
- Hydroelectric and fossil fuel plants generated 14.8 billion kWh in 1982, down 10 percent from the near record high generation of 16.6 billion kWh in 1981.
- Montana's coal-fired plants produced 3.8 billion kWh of electricity in 1982, down 24 percent from the previous year.
- Electric utilities sold 10.3 billion kWh of electricity in Montana in 1982. Preliminary estimates show residential customers paid an average of 3.58 cents per kilowatt-hour, commercial customers paid an average of 3.27 cents per kilowatt-hour, and industrial customers paid an average of 2.08 cents per kilowatt-hour.
- In early 1983, the average Montana household consuming 1,000 kilowatt-hours of electricity per month paid $40.42, while the average U. S. household paid $69.96 for 1,000 kilowatt-hours of electricity.

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TABLE 2.1
ELECTRIC POWER PLANTS BY PRIMARY FUEL
January 1984

HYDROELECTRIC PLANTS

Owner/Operator	Plant	County	Initial Year of Operation (First Unit)	GENERATION Capacity[1] (megawatts)	GENERATION Critical Water Year (average MW)	GENERATION Median Water Year (average MW)
Montana Light & Power Co.	Lake Creek	Lincoln	1916	5.0	2.3	2.8
Montana Power Company	Black Eagle	Cascade	1927	18.0	14.0	18.0
Montana Power Company	Cochrane	Cascade	1958	50.0	22.0	34.0
Montana Power Company	Flint Creek	Granite	1901	1.1	1.0	1.0
Montana Power Company	Hauser Lake	Lewis & Clark	1907	16.5	12.0	16.0
Montana Power Company	Holter	Lewis & Clark	1918	49.0	24.0	30.0
Montana Power Company	Kerr	Lake	1938	180.0	119.0	128.0
Montana Power Company	Milltown	Missoula	1906	3.4	2.0	2.0
Montana Power Company	Morony	Cascade	1930	47.0	25.0	36.0
Montana Power Company	Mystic Lake	Stillwater	1925	11.5	6.0	6.0
Montana Power Company	Rainbow	Cascade	1910	35.0	29.0	35.0
Montana Power Company	Ryan	Cascade	1915	60.0	41.0	56.0
Montana Power Company	Thompson Falls	Sanders	1915	40.0	35.0	34.0
Montana Power Company	Madison	Madison	1906	8.5	7.0	8.0
Pacific Power & Light Co.	Bigfork	Flathead	1910	4.0	3.0	3.5
U.S. Department of the Army, North Pacific Division, Corps of Engineers	Libby	Lincoln	1975	420.0	180.0	220.0
U.S. Department of the Army, Missouri River Division, Corps of Engineers	Fort Peck	McCone	1943	185.0	83.0	119.0
U.S. Department of the Interior, Bureau of Indian Affairs, Flathead Irrigation Project	Big Creek	Lake	1928	0.4	NA	NA
U.S. Department of the Interior, Bureau of Reclamation, Upper Missouri Region	Canyon Ferry	Lewis & Clark	1953	50.0	33.8	49.9
U.S. Department of the Interior, Bureau of Reclamation, Upper Missouri Region	Yellowtail	Big Horn	1966	250.00	66.1	122.8
U.S. Department of the Interior, Bureau of Reclamation, Pacific Northwest Region	Hungry Horse	Flathead	1952	285.0	96.0	108.0
Washington Water Power Co.	Noxon Rapids	Sanders	1959	396.9	147.9	198.0
TOTAL HYDROELECTRIC GENERATION				**2,116.3**		

TABLE 2.1 (continued)

FOSSIL FUEL FIRED PLANTS

Owner/Operator	Plant	County	Initial Year of Operation (First Unit)	GENERATION Capacity[1] (megawatts)	GENERATION Average (average MW)	Fuel
Montana-Dakota Utilities	Glendive	Dawson	1926	6.7		natural gas
Montana-Dakota Utilities	Glendive	Dawson	1979	41.0		natural gas; #2 fuel oil
Montana-Dakota Utilities	Lewis & Clark	Richland	1958	51.4		lignite
Montana-Dakota Utilities	Miles City	Custer	1972	18.4		natural gas
Montana Power Company	Frank Bird	Yellowstone	1951	69.0	60.0	oil; natural gas
Montana Power Company	J. E. Corette	Yellowstone	1968	173.0	139.0	subbituminous coal
Montana Power Company and Puget Sound Power & Light	Colstrip I	Rosebud	1975	358.0	270.0	subbituminous coal
Montana Power Company and Puget Sound Power & Light	Colstrip II	Rosebud	1976	358.0	270.0	subbituminous coal
Montana Power Company, Puget Sound Power & Light, Portland General Electric, Washington Water Power, and Pacific Power & Light	Colstrip III	Rosebud	1984	778.0	NA	subbituminous coal
Pacific Power & Light	Libby	Lincoln	1972	24.0	0.0	#2 fuel oil
TOTAL FOSSIL FUEL FIRED GENERATION				**1,877.5**		

OTHER PLANTS

Owner/Operator	Plant	County	Initial Year of Operation (First Unit)	GENERATION Capacity[1] (megawatts)	GENERATION Average (average MW)	Fuel
Montana Light & Power	Libby	Lincoln	1939	14.3	5.3	wood and waste products
TOTAL GENERATION FOR OTHER PLANTS				**14.3**		
TOTAL MONTANA (NAMEPLATE) GENERATING CAPACITY				**4,008.1**	megawatts	

[1] Unless otherwise specified, capacity denotes installed nameplate capacity.

TABLE 2.1 (continued)

NOTES: **Montana Light and Power Co.:** The average generation figure for the thermal generating units at Libby is a twelve-year average based on operating 365 days per year, 24 hours per day during that period. Generation is largely for in-plant use at the St. Regis Paper Company.

Pacific Power and Light Company: The Libby plant functions as a standby unit.

U.S. Department of the Army, Missouri River Division, Corps of Engineers: Figures are based on the 08-83-1980 Reservoir Control Study (RCC). Fort Peck's dependable capacity (183 MW) is the load-carrying ability of the power plant based on the eighth year (1961) of drought drawdown (from RCC study 08-83-1980). The nameplate capacity (185 MW) is the total electrical rating of the generators and does not depend on adverse hydrologic conditions as does dependable capacity.

U.S. Department of the Army, North Pacific Division, Corps of Engineers: The present nameplate installed capacity at Libby is 420 MW based on the four existing units; a fifth unit, scheduled to go on-line in October 1984, will raise the nameplate installed capacity to 525 MW. The units at Libby have been designed to operate at 15 percent overload to provide maximum output during periods of high power demand. Thus, under certain conditions, when the reservoir level is between elevation 2,459 feet (full) and elevation 2,411 feet, Libby now can generate 483 MW.

The dependable capacity, defined as the maximum January output during adverse streamflow conditions, is 353 MW. Dependable capacity is used in load-resources planning studies to measure a project's or system's capability to meet winter peak demand. January has historically been the month when maximum power demand occurs. Adverse conditions are defined as the worst single year in the 40-year period of record from 1929-68 conventionally used by Northwest utilities. The water year 1936-37 had the worst streamflows and lowest generation capability in the period of record; this year is used to model dependable capacity.

U.S. Department of the Interior, Bureau of Reclamation, Upper Missouri Region: For planning purposes, the eastern and western marketing regions can count on receiving up to a maximum of 125 MW each from the Yellowtail dam.

U.S. Department of the Interior, Bureau of Reclamation, Pacific Northwest Region: The Bureau of Reclamation office reports a critical *period* generation of 96.0 average megawatts rather than a critical *year* figure for the Hungry Horse dam, and the office reports a 40-year (1928-68) average generation of 108.0 average megawatts rather than a median water year figure.

Washington Water Power Co.: Energy generation for the critical water period assumes optimal coordinated operation of the reservoirs in the Northwest under streamflow and runoff conditions similar to those experienced during the four-year critical period from September 1928 through February 1932, the worst period on record. The maximum generating capacity is 554.0 MW; this is the peak output of the project with the reservoir full. Changes in reservoir elevation will affect the peak generating output.

Montana-Dakota Utilities: MDU prefers to use Uniform Rating of Generating Equipment (URGE) capacity ratings instead of nameplate capacities. URGE ratings are a generally accepted industry standard. URGE is a demonstrable and repeatable test for determining capacity ratings. Such ratings should be considered to be net maximum ratings.

The URGE capability test is an annual event. For this reason, URGE ratings may vary slightly from year to year. As a general rule of thumb, once a capability is established, it will remain essentially the same until operating procedures, upgrades, deratings, or some other such events change the rating.

MDU prefers to use a 1982 average generation figure determined by dividing the net total generation for 1982 by the total number of hours on-line. This computation results in the following figures:

Unit	Average Generation, 1982 (average MW/hour on-line)
Glendive (1926)	0.0
Glendive (1979)	11.4
Lewis & Clark	21.6
Miles City	9.5

The two Glendive units and the Miles City unit function as standby, emergency generation or peaking units.

Montana Power Company: The Frank Bird plant operates as a standby unit. MPC's *Loads and Resources* publication shows the Frank Bird plant's capacity as 70 MW and the J. E. Corette plant's capacity as 180 MW. The publication also shows the annual energy generation at the J. E. Corette plant to be 130 average MW.

Montana Power Company and Puget Sound Power and Light: According to *Loads and Resources*, Colstrip units 1 and 2 have a 330 MW net capacity each and a 248 average MW annual energy generation each.

Montana Power Company, et al.: Colstrip unit 3 underwent its initial synchronization test runs in October 1983 and began commercial operation in January 1984. The average generation figure will not be available until the unit has been in operation for some time. The unit has a net capacity of 770 MW and will have an estimated annual energy generation of 525 average MW after the first 12 months of operation, according to the *Loads and Resources* publication.

SOURCES: Personal communications with the utilities and government agencies operating each power plant, December 1983 and January 1984.

Montana Power Company data supplemented by figures from *The Montana Power Company Projections of Electric Loads and Resources, 1981-2000*, February 1981.

TABLE 2.2
NET ELECTRIC ENERGY GENERATION[1] BY TYPE OF FUEL UNIT, 1950-82

Year	TOTAL	HYDROELECTRIC		COAL		OIL		NATURAL GAS		WOOD AND WASTE	
	Million kWh Generated	Million kWh Generated	% of State Total	Million kWh Generated	% of State Total	Million kWh Generated	% of State Total	Million kWh Generated	% of State Total	Million kWh Generated	% of State Total
1950	**3,136**	3,107	99	NA		NA		NA		NA	
1951	**3,304**	3,259	99	NA		NA		NA		NA	
1952	**3,778**	3,464	92	NA		NA		NA		NA	
1953	**3,719**	3,424	92	NA		NA		NA		NA	
1954	**4,274**	4,246	99	NA		NA		NA		NA	
1955	**4,696**	4,679	99	NA		NA		NA		NA	
1956	**5,495**	5,459	99	NA		NA		NA		NA	
1957	**5,215**	4,969	95	NA		NA		NA		NA	
1958	**4,551**	4,224	93	NA		NA		NA		NA	
1959	**4,934**	4,720	96	NA		NA		NA		NA	
1960	**5,992**	5,801	97	NA		NA		NA		NA	
1961	**6,780**	6,499	96	263	4	0	0	19		0	0
1962	**7,051**	6,410	91	291	4	1	[2]	349	5	0	0
1963	**6,594**	6,011	91	284	4	0	0	299	5	0	0
1964	**7,360**	6,821	93	286	4	2	[2]	220	3	31	[2]
1965	**8,882**	8,389	94	285	3	0	0	171	2	37	[2]
1966	**8,611**	7,940	92	317	4	43	[2]	273	3	38	[2]
1967	**9,117**	8,703	95	314	3	3	[2]	41	[2]	56	1
1968	**9,495**	8,925	94	434	5	10	[2]	52	[2]	74	1
1969	**10,442**	9,447	90	735	7	52	[2]	147	1	61	1
1970	**10,026**	8,745	87	966	10	14	[2]	228	2	73	1
1971	**10,653**	9,595	90	901	8	1	[2]	96	1	60	1
1972	**10,689**	9,444	88	1,079	10	7	[2]	108	1	50	[2]
1973	**9,132**	7,517	82	1,303	14	69	[2]	195	2	48	1
1974	**11,056**	9,726	88	1,210	11	6	[2]	98	1	16	[2]
1975	**11,231**	9,560	85	1,544	14	17	[2]	96	1	14	[2]
1976	**16,091**	12,402	77	3,558	22	27	[2]	67	[2]	37	[2]
1977	**13,473**	8,460	63	4,788	36	92	1	87	1	46	[2]
1978	**16,750**	11,708	70	4,871	29	35	[2]	84	[2]	52	[2]
1979	**15,756**	10,344	66	5,114	32	58	[2]	188	1	52	[2]
1980	**15,496**	9,966	64	5,140	33	22	[2]	351	2	17	[2]
1981	**16,593**	11,324	68	5,047	30	12	[2]	175	1	34	[2]
1982	**14,844**	10,920	74	3,853	26	10	[2]	33	[2]	28	[2]

[1] Gross generation less the electric energy consumed at the generating station.
[2] Less than or equal to 0.5 percent.

SOURCES: Federal Power Commission (1950-76); U.S. Department of Energy, Energy Information Administration, *Power Production, Fuel Consumption and Installed Capacity Data*, annual reports for 1977-80 (EIA-0049); U.S. Department of Energy, Energy Information Administration, *Electric Power Annual*, annual reports for 1981-82 (EIA-0348).

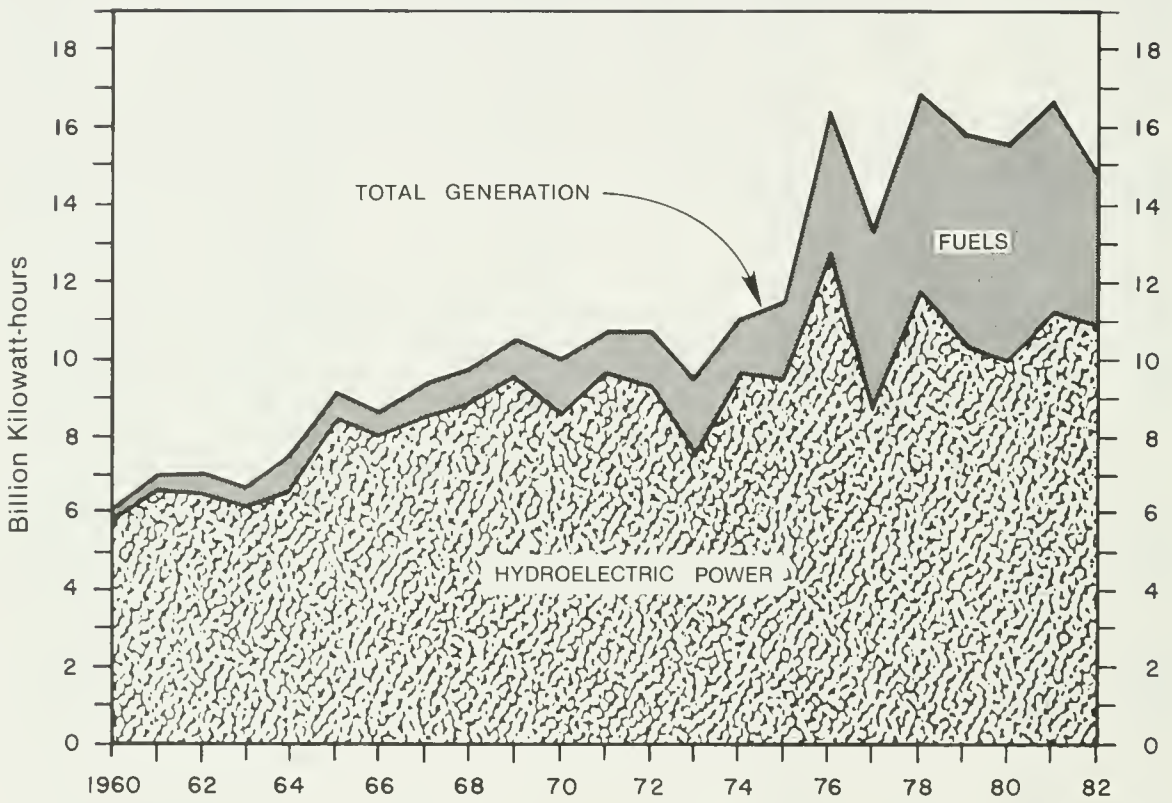

FIGURE 2.1 ANNUAL GENERATION OF ELECTRICITY, 1960-82

SOURCE: Table 2.2.

TABLE 2.3
MONTHLY SALES OF ELECTRICITY TO ULTIMATE CONSUMERS, 1960-83
(thousand kilowatt-hours)

Year	Sector	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1960	Residential	87,817	86,156	86,172	78,700	74,016	71,708	69,122	70,021	72,281	72,788	78,160	88,423	935,364
	Commercial	40,851	40,920	40,693	37,987	38,233	37,677	37,542	39,941	40,747	39,473	40,556	44,419	479,039
	Industrial	192,702	206,245	262,319	263,102	267,841	261,080	249,175	250,586	249,098	255,737	243,306	250,196	2,951,387
	Other	15,930	16,460	17,522	17,095	16,958	16,398	16,005	19,356	18,150	18,847	17,586	18,413	208,720
	TOTAL	**337,300**	**349,781**	**406,706**	**396,884**	**397,048**	**386,863**	**371,844**	**379,904**	**380,276**	**386,845**	**379,608**	**401,451**	**4,574,510**
1961	Residential	94,714	89,265	82,793	79,128	78,238	75,587	72,428	72,221	77,654	79,289	83,809	96,727	981,853
	Commercial	43,745	44,111	40,965	40,209	40,766	43,527	42,932	42,376	45,316	41,664	44,097	48,062	517,770
	Industrial	245,523	222,879	241,307	239,366	255,179	250,378	254,137	249,779	237,969	252,472	254,771	271,577	2,975,337
	Other	17,447	17,069	18,282	16,729	17,031	17,904	18,566	21,490	20,826	18,835	18,577	19,636	222,392
	TOTAL	**401,429**	**373,324**	**383,347**	**375,432**	**391,214**	**387,396**	**388,063**	**385,866**	**381,765**	**392,260**	**401,254**	**436,002**	**4,697,352**
1962	Residential	103,908	101,586	94,433	87,906	78,729	80,367	75,441	75,490	79,620	80,599	86,901	96,516	1,041,496
	Commercial	48,422	48,102	45,271	44,031	43,209	43,721	44,099	45,949	45,939	44,353	47,717	49,951	550,764
	Industrial	270,801	243,237	277,876	277,380	283,922	271,608	244,388	238,120	228,811	252,574	249,926	260,819	3,099,462
	Other	19,118	18,525	21,089	21,697	19,619	19,238	20,484	23,301	22,951	23,013	21,460	23,893	254,388
	TOTAL	**442,249**	**411,450**	**438,669**	**431,014**	**425,479**	**414,934**	**384,412**	**382,860**	**377,321**	**400,539**	**406,004**	**431,179**	**4,946,110**
1963	Residential	103,835	110,481	94,644	86,648	85,447	81,989	79,996	80,482	82,349	82,375	87,151	102,086	1,077,483
	Commercial	49,276	50,336	46,788	46,194	45,541	46,639	47,013	48,163	48,917	46,782	47,620	50,646	573,915
	Industrial	263,088	244,329	269,286	260,528	257,708	252,494	254,657	265,693	263,189	279,350	279,286	301,282	3,190,890
	Other	22,146	22,082	22,755	21,353	21,007	20,379	19,564	24,581	22,728	21,934	19,814	20,273	258,616
	TOTAL	**438,345**	**427,228**	**433,473**	**414,723**	**409,703**	**401,501**	**401,230**	**418,919**	**417,183**	**430,441**	**433,871**	**474,287**	**5,100,904**
1964	Residential	113,972	104,130	99,613	98,215	90,238	83,836	83,917	85,367	86,431	89,147	93,850	109,881	1,138,597
	Commercial	53,376	52,679	50,467	49,839	48,678	47,549	48,107	52,939	50,029	49,286	52,242	54,615	609,806
	Industrial	269,594	278,635	307,385	287,199	310,487	305,908	295,793	296,836	299,569	307,596	299,974	284,944	3,543,920
	Other	21,883	22,113	21,961	20,066	20,042	19,200	19,516	22,078	17,852	21,559	20,456	21,846	248,572
	TOTAL	**458,825**	**457,557**	**479,426**	**455,319**	**469,445**	**456,493**	**447,333**	**457,220**	**453,881**	**467,588**	**466,522**	**471,286**	**5,540,895**
1965	Residential	129,757	113,046	107,890	106,939	94,738	90,005	87,104	89,052	92,750	97,290	96,245	111,332	1,216,148
	Commercial	58,183	55,780	53,569	54,060	53,351	50,867	51,996	56,258	54,504	54,215	54,487	57,001	654,271
	Industrial	295,828	283,795	302,647	308,369	315,466	328,079	292,282	310,484	365,742	379,338	377,321	380,099	3,939,450
	Other	23,186	23,626	23,660	22,740	22,635	20,825	21,123	23,415	20,177	22,706	22,808	23,594	270,495
	TOTAL	**506,954**	**476,247**	**487,766**	**492,108**	**486,190**	**489,776**	**452,505**	**479,209**	**533,173**	**553,549**	**550,861**	**572,026**	**6,080,364**
1966	Residential	121,350	124,626	113,653	103,495	99,313	93,596	91,931	93,336	96,337	96,360	105,035	122,301	1,261,333
	Commercial	58,913	60,674	57,259	55,579	55,861	55,136	57,741	59,368	59,127	58,393	59,464	60,268	697,783
	Industrial	387,237	351,127	381,773	375,749	384,072	376,720	381,588	391,139	394,768	398,414	405,337	429,369	4,657,293
	Other	24,598	25,287	26,810	24,087	23,293	21,871	22,643	24,784	21,636	24,241	22,453	24,169	285,872
	TOTAL	**592,098**	**561,714**	**579,495**	**558,910**	**562,539**	**547,323**	**553,903**	**568,627**	**571,868**	**577,408**	**592,289**	**636,107**	**6,902,281**
1967	Residential	126,433	118,444	114,427	111,864	102,479	98,793	96,131	93,841	99,771	97,523	107,138	123,724	1,290,568
	Commercial	63,164	62,283	60,029	59,857	58,476	58,722	59,151	62,878	65,324	69,143	62,491	64,956	746,474
	Industrial	399,328	371,653	396,090	389,956	414,910	409,363	349,729	306,514	311,801	313,395	304,872	314,563	4,282,174
	Other	24,113	25,248	26,258	25,110	23,481	23,089	23,918	25,814	22,892	24,081	24,225	24,479	292,978
	TOTAL	**613,038**	**577,628**	**596,804**	**586,787**	**599,346**	**589,967**	**528,929**	**489,047**	**499,788**	**504,142**	**498,726**	**527,992**	**6,612,194**
1968	Residential	143,663	132,768	121,232	108,338	106,581	104,089	100,963	103,557	102,645	105,823	114,265	129,362	1,373,286
	Commercial	71,463	67,767	65,410	61,562	63,963	65,534	62,364	67,865	66,533	72,710	68,798	71,000	804,969
	Industrial	349,224	301,692	313,222	359,362	415,545	412,147	410,516	463,261	453,171	470,785	514,629	518,356	4,981,910
	Other	26,187	27,093	27,845	22,534	21,925	21,883	20,467	23,614	19,135	21,451	20,882	19,966	272,982
	TOTAL	**590,537**	**529,320**	**527,709**	**551,796**	**608,014**	**603,653**	**594,310**	**658,297**	**641,484**	**670,769**	**718,574**	**738,684**	**7,433,147**
1969	Residential	152,981	157,716	137,080	120,995	107,597	107,005	106,310	107,962	110,372	109,020	123,285	121,922	1,462,245
	Commercial	73,626	79,263	69,229	68,222	67,227	67,699	67,513	72,415	73,330	78,114	71,722	75,036	863,396
	Industrial	523,416	499,814	517,631	515,532	524,633	515,044	509,530	520,316	490,956	517,126	543,581	530,666	6,208,245
	Other	20,957	23,362	24,550	21,783	21,110	20,894	17,922	19,890	18,498	19,675	19,626	18,842	247,109
	TOTAL	**770,980**	**760,155**	**748,490**	**726,532**	**720,567**	**710,642**	**701,275**	**720,583**	**693,156**	**723,935**	**758,214**	**746,466**	**8,780,995**

TABLE 2.3 (continued)

Year	Sector	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1970	Residential	152,800	147,131	130,734	126,382	120,747	111,014	111,686	117,988	117,328	120,147	129,342	148,732	1,534,031
	Commercial	78,481	78,370	72,151	72,549	72,646	70,889	74,235	80,235	79,091	87,240	77,183	80,540	923,610
	Industrial	535,198	507,080	517,064	521,683	524,102	499,228	509,589	489,343	464,671	493,165	497,404	470,212	6,028,739
	Other	20,146	22,016	24,030	22,554	22,192	22,161	24,076	24,744	20,763	20,118	21,019	19,914	263,733
	TOTAL	**786,625**	**754,597**	**743,979**	**743,168**	**739,687**	**703,292**	**719,586**	**712,310**	**681,853**	**720,670**	**724,948**	**719,398**	**8,750,113**
1971	Residential	171,644	157,263	138,901	135,619	123,858	117,446	118,165	122,788	129,015	124,349	136,480	157,000	1,632,528
	Commercial	87,202	83,537	78,458	78,899	78,903	76,350	78,401	82,514	85,580	92,637	80,452	86,892	989,825
	Industrial	512,277	490,144	496,830	510,798	528,034	528,014	454,859	428,468	378,792	519,353	551,435	600,152	5,999,156
	Other	21,318	22,036	21,285	23,467	23,067	21,581	22,505	24,363	21,012	21,838	22,599	23,406	268,477
	TOTAL	**792,441**	**752,980**	**735,474**	**748,783**	**753,862**	**743,391**	**673,930**	**658,133**	**614,399**	**758,177**	**790,966**	**867,450**	**8,889,986**
1972	Residential	196,308	174,977	159,083	139,973	129,697	129,433	126,990	125,023	134,719	131,454	146,473	174,196	1,768,326
	Commercial	99,573	98,759	85,723	82,667	80,349	85,918	84,421	84,408	91,807	91,910	87,636	96,428	1,069,599
	Industrial	383,841	367,497	547,387	532,198	531,324	484,725	494,943	480,897	475,312	492,458	470,817	398,909	5,660,308
	Other	22,537	21,683	23,962	22,315	22,021	22,468	20,535	22,039	21,171	21,633	21,567	22,610	264,541
	TOTAL	**702,259**	**662,916**	**816,155**	**777,153**	**763,391**	**722,544**	**726,889**	**712,367**	**723,009**	**737,455**	**726,493**	**692,143**	**8,762,774**
1973	Residential	196,308	174,977	155,431	145,404	136,810	131,440	134,731	138,222	142,991	134,836	151,242	169,992	1,812,384
	Commercial	99,573	98,759	91,616	89,892	88,813	89,850	94,218	99,168	98,973	89,397	92,215	92,810	1,125,284
	Industrial	383,841	367,497	429,807	429,508	391,416	370,707	384,180	428,935	434,784	466,258	478,403	468,563	5,033,899
	Other	22,537	21,683	22,045	21,664	21,123	20,615	20,508	20,327	18,181	18,956	18,528	19,528	245,695
	TOTAL	**702,259**	**662,916**	**698,899**	**686,468**	**638,162**	**612,612**	**633,637**	**686,652**	**694,929**	**709,447**	**740,388**	**750,893**	**8,217,262**
1974	Residential	185,102	178,463	154,353	152,674	139,598	142,545	146,882	156,208	145,167	141,631	154,677	175,550	1,872,850
	Commercial	98,697	97,157	90,171	91,900	86,088	91,539	98,340	104,597	96,879	103,383	95,650	102,055	1,156,456
	Industrial	492,483	491,482	504,374	447,331	439,410	450,886	507,271	511,013	504,551	545,501	546,527	487,813	5,928,642
	Other	20,837	21,098	21,008	19,541	19,077	17,505	16,576	16,611	14,336	16,962	13,771	15,859	213,181
	TOTAL	**797,119**	**788,200**	**769,906**	**711,446**	**684,173**	**702,475**	**769,069**	**788,429**	**760,933**	**807,477**	**810,625**	**781,277**	**9,171,129**
1975	Residential	197,113	197,400	185,873	172,523	162,091	150,032	154,294	164,663	160,058	144,833	170,283	198,560	2,057,723
	Commercial	106,850	109,601	105,285	97,526	100,689	97,171	102,615	110,064	103,845	116,764	102,254	97,590	1,250,254
	Industrial	502,334	468,418	444,306	423,351	420,191	394,480	391,641	384,746	402,479	413,633	438,613	385,277	5,069,469
	Other	16,027	16,803	16,816	15,749	15,943	17,103	16,433	17,883	15,282	16,100	16,484	16,730	197,353
	TOTAL	**822,324**	**792,222**	**752,280**	**709,149**	**698,914**	**658,786**	**664,983**	**677,356**	**681,664**	**691,330**	**727,634**	**698,157**	**8,574,799**
1976	Residential	241,286	224,354	215,650	188,027	172,354	155,076	159,897	163,718	163,180	161,084	188,024	227,972	2,261,000
	Commercial	135,656	120,033	138,292	125,658	117,737	118,578	123,076	127,036	127,802	123,816	128,418	139,325	1,525,000
	Industrial	430,307	417,454	418,118	422,976	475,160	524,969	536,980	509,190	242,368	534,606	553,161	536,896	5,922,000
	Other	18,228	18,619	17,927	17,454	17,249	16,683	15,884	31,570	347	15,931	16,427	16,754	203,000
	TOTAL	**825,477**	**780,460**	**789,987**	**754,115**	**782,500**	**815,306**	**835,837**	**831,514**	**533,697**	**835,437**	**886,030**	**920,947**	**9,911,000**
1977	Residential	253,749	258,803	217,115	212,474	182,513	171,838	162,720	166,556	174,463	179,015	196,996	263,448	2,440,000
	Commercial	140,085	147,674	134,726	133,308	127,309	129,217	129,935	136,898	137,011	129,616	129,696	149,868	1,625,000
	Industrial	554,502	506,893	503,940	501,779	477,528	458,817	452,227	444,899	460,422	451,969	480,088	466,145	5,759,000
	Other	17,478	17,568	16,518	15,764	15,859	15,444	15,119	14,947	14,773	14,735	14,955	15,918	189,000
	TOTAL	**965,814**	**930,938**	**872,299**	**863,325**	**803,209**	**775,316**	**760,001**	**763,300**	**786,669**	**775,335**	**821,735**	**895,379**	**10,013,000**
1978	Residential	303,487	304,192	273,393	225,954	203,167	186,810	176,290	174,003	179,267	185,936	212,693	312,547	2,754,000
	Commercial	156,693	159,381	153,436	142,065	132,248	133,658	141,128	141,397	145,453	138,251	144,122	172,000	1,768,000
	Industrial	500,632	493,841	510,198	500,102	482,065	488,834	518,796	513,508	531,311	524,655	516,905	527,030	6,106,000
	Other	16,742	17,803	17,714	16,386	15,924	14,134	15,197	14,456	14,868	14,481	14,955	16,231	158,000
	TOTAL	**977,554**	**975,217**	**954,741**	**884,507**	**833,404**	**823,436**	**851,411**	**843,364**	**870,899**	**863,323**	**888,675**	**1,027,808**	**10,786,000**
1979	Residential	365,184	370,428	307,256	247,147	228,287	195,000	186,000	187,000	191,000	186,000	214,000	281,000	2,957,000
	Commercial	179,217	182,143	168,278	148,601	148,399	146,000	152,000	158,000	158,000	150,000	148,000	169,000	1,907,000
	Industrial	508,841	458,727	501,042	492,078	503,004	522,000	537,000	512,000	518,000	529,000	518,000	511,000	6,111,000
	Other	13,847	14,784	14,600	13,376	13,451	13,000	13,000	12,000	12,000	12,000	11,000	11,000	154,000
	TOTAL	**1,067,089**	**1,026,082**	**991,176**	**901,202**	**893,141**	**876,000**	**889,000**	**870,000**	**879,000**	**877,000**	**891,000**	**973,000**	**11,129,000**

TABLE 2.3 (continued)

Year	Sector	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1980	Residential	312,000	329,000	306,000	264,000	217,000	204,000	187,000	192,000	192,000	198,000	223,000	292,000	**2,916,000**
	Commercial	174,000	179,000	176,000	159,000	157,000	153,000	153,000	163,000	155,000	154,000	157,000	177,000	**1,957,000**
	Industrial	533,000	517,000	524,000	516,000	506,000	480,000	456,000	461,000	449,000	441,000	443,000	489,000	**5,815,000**
	Other	12,000	12,000	13,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	12,000	**137,000**
	TOTAL	**1,031,000**	**1,037,000**	**1,019,000**	**951,000**	**891,000**	**848,000**	**808,000**	**828,000**	**808,000**	**804,000**	**834,000**	**970,000**	**10,825,000**
1981	Residential	318,000	295,000	289,000	247,000	229,000	210,000	199,000	193,000	202,000	207,000	235,000	285,000	2,906,000
	Commercial	183,000	177,000	178,000	163,000	160,000	161,000	158,000	170,000	178,000	170,000	165,000	180,000	2,045,000
	Industrial	489,000	461,000	501,000	485,000	496,000	491,000	503,000	513,000	505,000	474,000	448,000	480,000	5,848,000
	Other	14,000	14,000	14,000	13,000	14,000	12,000	13,000	13,000	11,000	13,000	13,000	12,000	157,000
	TOTAL	**1,004,000**	**947,000**	**981,000**	**908,000**	**899,000**	**874,000**	**873,000**	**888,000**	**897,000**	**865,000**	**861,000**	**958,000**	**10,956,000**
1982	Residential	356,000	373,000	312,000	279,000	251,000	218,000	204,000	200,000	202,000	217,000	242,000	323,000	3,178,000
	Commercial	202,000	210,000	188,000	177,000	172,000	162,000	171,000	176,000	184,000	169,000	171,000	199,000	2,180,000
	Industrial	438,000	385,000	389,000	390,000	392,000	383,000	395,000	382,000	407,000	416,000	387,000	394,000	4,759,000
	Other	14,000	14,000	14,000	13,000	14,000	13,000	13,000	14,000	11,000	13,000	13,000	13,000	159,000
	TOTAL	**1,009,000**	**982,000**	**904,000**	**860,000**	**830,000**	**775,000**	**783,000**	**773,000**	**804,000**	**815,000**	**812,000**	**930,000**	**10,276,000**
1983	Residential	348,000	315,000	284,000	268,000	244,000	224,000	206,000	213,000	218,000	223,000			
	Commercial	206,000	197,000	187,000	182,000	180,000	179,000	193,000	208,000	206,000	191,000			
	Industrial	393,000	315,000	317,000	311,000	313,000	322,000	352,000	349,000	362,000	387,000			
	Other	14,000	14,000	15,000	13,000	13,000	13,000	15,000	12,000	14,000	13,000			
	TOTAL	**961,000**	**840,000**	**804,000**	**774,000**	**750,000**	**737,000**	**765,000**	**782,000**	**800,000**	**814,000**			

NOTE: In June 1979, DOE changed from reporting in thousands of kilowatt-hours to reporting in millions of kilowatt-hours. Accordingly, beginning in 1979, total annual figures are computed from figures rounded to the nearest million kilowatt-hours.

All 1981 figures have been revised due to a change in DOE reporting definitions; DOE revised the annual totals (but not the monthly detail figures) for the years 1976-1980 to reflect the new reporting definitions.

SOURCES: Federal Power Commission (1960-76); U.S. Department of Energy, Energy Information Administration, *Electric Power Statistics*, monthly reports for 1977-78 (EIA-0034); U.S. Department of Energy, Energy Information Administration, *Financial Statistics of Electric Utilities and Interstate Natural Gas Pipeline Companies*, monthly reports for 1979 through February 1980 (EIA-0147); U.S. Department of Energy, Energy Information Administration, *Sales, Revenue, and Income of Electric Utilities*, monthly reports for March 1980 through October 1981 (EIA-0147); U.S. Department of Energy, Energy Information Administration, *Electric Power Monthly*, monthly reports for November 1981 through November 1983 (EIA-0226).

Annual totals are revised based on information in the U.S. Department of Energy, Energy Information Administration, *Electric Power Annual* publications (EIA-0348).

Data for September and December 1982, and for January, February, and March 1983, which were not printed during transitions in publication format, were obtained directly from DOE.

TABLE 2.4
ANNUAL SALES OF ELECTRICITY BY CLASS OF SERVICE, 1950-82
(million kilowatt-hours)

Year	TOTAL SALES TO ULTIMATE CUSTOMERS	Residential	Commercial	Industrial	Street & Highway Lighting	Other Public Authorities	Railroads and Railways	Inter-departmental
1950	2,351	378	219	1,559	16	15	154	11
1951	2,437	423	238	1,566	18	19	164	10
1952	2,699	484	256	1,757	20	17	159	6
1953	3,002	501	302	1,987	20	33	154	5
1954	2,772	562	351	1,649	24	33	145	8
1955	3,658	643	389	2,407	25	34	154	6
1956	4,666	720	416	3,309	26	37	153	5
1957	4,418	782	462	2,975	28	40	127	4
1958	4,268	810	474	2,796	29	43	108	8
1959	4,074	893	512	2,468	30	55	99	17
1960	4,617	935	529	2,973	33	52	89	6
1961	4,774	953	603	3,028	33	69	83	5
1962	5,044	1,024	652	3,152	36	82	91	7
1963	5,192	1,055	715	3,190	36	102	88	6
1964	5,647	1,117	772	3,534	39	105	75	5
1965	6,228	1,172	846	3,965	40	114	85	6
1966	7,076	1,207	894	4,718	43	121	88	6
1967	6,866	1,310	936	4,338	43	144	82	13
1968	7,741	1,385	1,027	5,055	47	140	69	18
1969	9,152	1,469	1,117	6,316	51	123	57	19
1970	9,091	1,521	1,188	6,120	52	117	73	20
1971	9,214	1,614	1,254	6,079	53	113	80	21
1972	9,191	1,710	1,325	5,888	53	113	81	21
1973	8,572	1,852	1,447	5,031	55	117	52	18
1974	9,540	1,877	1,488	5,963	57	113	23	19
1975	8,867	2,038	1,544	5,089	64	113	—	19
1976	9,891	2,232	1,669	5,795	60	115	—	20
1977	10,036	2,433	2,225	5,195	60	101	—	22
1978	10,748	2,667	1,930	5,953	60	104	—	24
1979	11,066	2,868	2,062	5,945	61	107	—	23
1980	10,849	2,894	2,119	5,661	61	97	—	17
1981	11,048	2,946	2,114	5,797	61	114	—	16
1982p	10,435	3,175	2,167	4,882	62	132	—	17

p Preliminary.

SOURCE: Edison Electric Institute, *Statistical Yearbook of the Electric Utility Industry*, 1950-82.

TABLE 2.5
AVERAGE ANNUAL PRICES FOR ELECTRICITY SOLD BY CLASS OF SERVICE, 1950-82
(cents per kilowatt-hour)

Year	TOTAL SALES TO ULTIMATE CUSTOMERS	Residential	Commercial	Industrial	Street & Highway Lighting	Other Public Authorities	Railroads and Railways	Inter-departmental
1950	1.06	2.70	2.42	0.50	2.41	0.84	0.57	0.54
1951	1.08	2.66	2.37	0.51	2.32	0.73	0.54	0.56
1952	1.08	2.60	2.39	0.50	2.28	0.80	0.54	0.82
1953	1.03	2.52	2.42	0.47	2.35	0.52	0.54	0.88
1954	1.14	2.44	2.37	0.48	2.18	0.58	0.54	0.73
1955	0.99	2.34	2.32	0.43	2.25	0.60	0.54	0.92
1956	0.86	2.34	2.17	0.38	2.32	0.65	0.55	1.10
1957	0.93	2.28	2.08	0.40	2.30	0.66	0.54	1.38
1958	0.99	2.34	2.15	0.41	2.39	0.67	0.54	0.88
1959	1.10	2.37	2.22	0.43	2.56	0.70	0.55	0.59
1960	1.05	2.33	2.25	0.43	2.45	0.79	0.56	1.27
1961	1.06	2.32	2.18	0.45	2.70	0.74	0.55	1.70
1962	1.07	2.29	2.13	0.46	2.50	0.61	0.55	1.43
1963	1.07	2.25	2.06	0.45	2.78	0.78	0.57	1.67
1964	1.03	2.20	2.02	0.45	2.56	0.71	0.53	2.00
1965	0.98	2.12	1.93	0.44	2.75	0.70	0.59	1.67
1966	0.92	2.09	1.92	0.43	2.56	0.66	0.57	1.67
1967	0.95	2.04	1.89	0.42	2.79	0.63	0.49	1.08
1968	0.90	1.99	1.83	0.40	2.77	0.61	0.58	1.11
1969	0.88	2.10	1.93	0.41	2.75	0.57	0.53	1.05
1970	0.94	2.13	1.94	0.42	2.88	0.60	0.55	1.00
1971	0.95	2.12	1.94	0.43	3.02	0.62	0.50	0.95
1972	1.00	2.16	1.98	0.44	3.21	0.53	0.49	1.19
1973	1.16	2.21	2.04	0.53	3.27	0.60	0.58	1.67
1974	1.10	2.23	2.05	0.50	3.23	0.58	0.53	1.41
1975	1.25	2.19	2.08	0.62	2.99	0.58	—	1.51
1976	1.24	2.23	2.06	0.60	3.32	0.73	—	1.67
1977	1.38	2.38	1.90	0.67	3.53	0.80	—	1.79
1978	1.53	2.62	2.50	0.72	3.88	0.87	—	2.16
1979	1.62	2.67	2.52	0.80	3.86	0.87	—	1.99
1980	1.87	2.95	2.78	0.98	4.00	0.97	—	1.91
1981	2.24	3.38	3.19	1.30	4.50	1.42	—	2.34
1982p	2.79	3.58	3.27	2.08	4.69	1.71	—	2.70

p Preliminary.

NOTE: Average annual prices were calculated by dividing total revenue (thousands of dollars) by total sales (millions of kilowatt-hours).

SOURCE: Edison Electric Institute, *Statistical Yearbook of the Electric Utility Industry*, 1950-82.

TABLE 2.6
INDUSTRIAL CONSUMPTION OF ELECTRICITY BY STANDARD INDUSTRIAL CLASSIFICATION CODE, 1976-82
(million kilowatt-hours)

SIC CODE	INDUSTRY	1976	1977	1978	1979	1980	1981	1982
	Mining							
10	Metal Mining	w	233.380	201.796	w	w	w	w
13	Crude Petroleum, Natural Gas	194.452	193.426	185.680	189.115	211.816	217.052	219.546
14	Nonmetallic Mineral Mining	44.872	49.120	53.629	53.352	56.644	56.678	53.068
	Manufacturing							
20	Food and Kindred Products	64.755	69.999	68.776	74.389	72.170	81.682	67.252
24	Lumber and Wood Products	292.440	320.798	335.447	333.245	293.054	298.032	261.707
27	Printing and Publishing	6.977	7.242	6.886	7.147	7.467	7.536	7.441
28	Chemical Products	456.759	470.337	457.470	469.238	408.566	410.933	433.482
29	Petroleum Products	289.415	356.770	331.241	379.584	343.648	382.124	415.188
32	Stone, Clay, Glass, Concrete	90.552	90.383	87.454	81.541	79.256	85.399	81.495
33	Primary Metals	3,446.846	3,595.952	3,603.122	3,560.284	3,282.929	3,120.978	2,170.278
34	Fabricated Metals	1.132	1.232	1.076	1.164	1.069	0.999	0.887
35	Nonelectric Machinery	0.887	0.620	1.783	6.367	6.652	5.686	5.803
37	Transportation Equipment	1.120	1.142	1.115	1.375	0.976	0.906	0.877
All Other[1]		461.127	167.703	199.870	454.528	440.209	604.356	521.042
	TOTAL	**5,351.334**	**5,558.105**	**5,535.344**	**5,611.330**	**5,204.459**	**5,272.362**	**4,238.065**

w Withheld to avoid disclosure of individual firms; combined in "all other" category.

[1]SIC codes 12- Bituminous coal, lignite mining
16- Construction other than building construction
25- Furniture and fixtures
26- Paper and allied products
31- Leather and leather products
38- Measuring, analyzing, and controlling instruments, etc.
are combined in "all other" to avoid disclosure of individual firms.

SOURCE: Maureen L. O'Connor, Research Department, Federal Reserve Bank of Minneapolis.

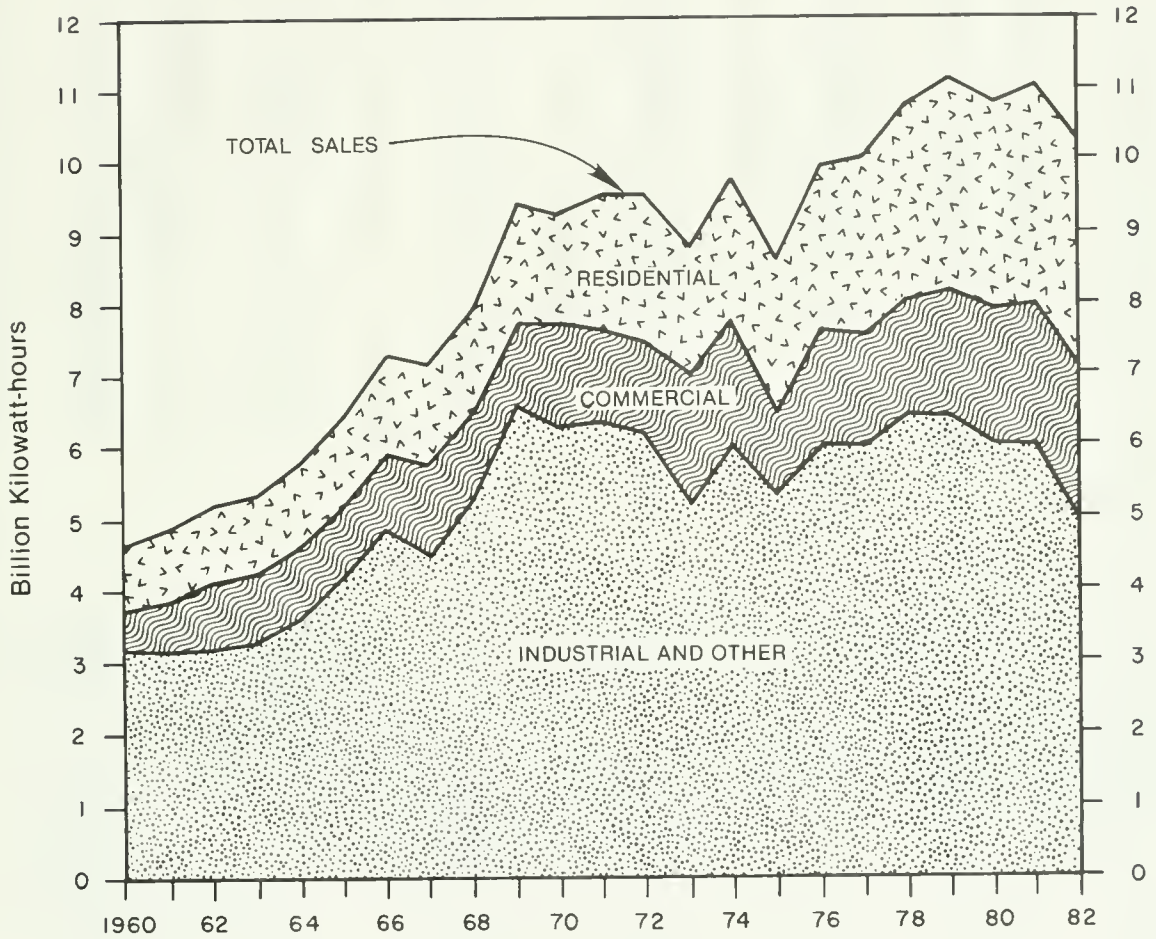

FIGURE 2.2 ANNUAL SALES OF ELECTRICITY, 1960-82

SOURCE: Table 2.3.

TABLE 2.7
MONTHLY CONSUMPTION OF FUELS BY ELECTRIC UTILITIES, 1960-83
(Coal: thousand short tons; Petroleum: thousand barrels; Natural Gas: million cubic feet)

Year	FUEL	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1960	Coal	22.6	20.0	21.3	15.2	14.2	4.8	13.5	14.7	9.1	11.9	15.7	23.9	**186.9**
	Oil	0.0	'	'	'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	'
	Gas	51.1	44.0	52.8	49.0	25.8	16.7	7.7	9.2	12.1	7.3	17.1	48.5	**341.3**
1961	Coal	24.1	19.8	25.6	21.9	25.0	5.6	20.1	23.9	18.3	23.1	24.7	30.4	**262.5**
	Oil	0.0	0.0	0.0	'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	'
	Gas	30.2	24.6	18.9	18.0	8.2	7.7	7.3	9.9	6.3	17.6	9.2	198.2	**356.2**
1962	Coal	29.5	25.7	29.3	23.3	26.2	11.7	21.8	23.9	19.9	26.4	23.6	30.3	**291.6**
	Oil	0.9	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.3**
	Gas	329.0	312.4	396.4	374.2	148.1	100.7	6.7	308.7	488.0	506.3	485.2	256.8	**3,712.5**
1963	Coal	31.8	27.1	26.2	27.3	29.0	3.5	24.4	25.9	17.3	25.5	22.4	25.1	**285.5**
	Oil	0.6	0.0	0.0	0.0	'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.7**
	Gas	341.7	220.0	275.3	263.3	28.6	160.2	209.0	351.2	413.7	363.8	308.2	368.3	**3,303.3**
1964	Coal	21.8	19.9	25.3	21.5	24.5	28.0	25.7	23.9	18.7	24.8	26.2	33.5	**293.8**
	Oil	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	**3.6**
	Gas	213.7	202.8	213.8	200.7	58.9	132.8	194.3	237.9	283.2	276.4	186.3	248.7	**2,449.5**
1965	Coal	29.4	24.4	28.2	28.6	21.1	23.0	25.5	12.3	26.6	26.0	27.2	23.5	**295.8**
	Oil	0.0	'	0.0	0.0	0.0	0.0	0.1	'	0.3	0.0	0.0	0.2	**0.7**
	Gas	199.3	176.8	187.6	173.0	5.7	115.8	163.6	179.4	185.4	185.2	191.6	228.9	**1,992.3**
1966	Coal	31.9	29.5	24.8	27.4	30.3	27.0	29.1	12.8	25.1	28.7	27.8	29.1	**323.5**
	Oil	0.5	0.0	1.3	0.4	0.3	0.1	3.3	24.0	20.8	20.9	10.6	0.0	**82.2**
	Gas	225.9	192.0	209.7	189.3	217.9	161.0	260.1	267.3	241.1	297.5	408.4	307.0	**2,977.2**
1967	Coal	29.8	29.0	28.6	24.8	27.0	19.8	20.9	27.6	28.8	27.8	27.8	33.5	**325.4**
	Oil	'	2.0	4.0	0.0	0.0	0.0	0.0	0.0	'	0.0	'	0.0	**6.1**
	Gas	223.0	171.8	56.5	12.0	3.7	6.6	5.3	4.3	3.1	6.5	4.9	4.8	**502.5**
1968	Coal	34.4	29.6	25.1	29.7	28.7	28.6	25.7	19.9	33.9	56.5	37.8	49.3	**399.2**
	Oil	0.0	0.0	0.0	0.0	0.0	'	8.2	3.2	0.0	'	3.3	8.1	**22.9**
	Gas	7.5	2.9	3.7	1.8	3.8	2.8	97.4	142.3	30.0	85.6	120.1	133.4	**631.3**
1969	Coal	56.9	52.9	56.9	47.6	30.3	27.8	44.8	35.6	77.6	44.2	41.5	57.8	**576.6**
	Oil	11.9	1.5	5.5	0.0	3.4	2.8	1.3	0.5	0.0	37.1	25.5	15.4	**104.9**
	Gas	149.4	91.3	115.4	82.2	138.9	177.4	123.3	86.2	92.3	178.2	149.2	136.7	**1,520.5**
1970	Coal	82.4	56.9	67.5	51.2	36.9	25.5	29.6	33.3	67.0	89.7	91.1	91.6	**722.7**
	Oil	13.0	11.3	1.4	0.0	'	0.1	0.1	0.0	0.0	'	0.0	'	**26.0**
	Gas	159.7	126.5	106.4	94.5	160.2	197.2	294.7	141.4	70.3	106.0	457.6	614.9	**2,529.4**
1971	Coal	92.0	60.5	58.3	48.4	43.3	44.4	33.9	15.7	30.3	71.0	87.5	86.7	**672.0**
	Oil	'	0.1	'	0.0	'	'	'	0.0	0.0	'	0.0	0.0	**0.2**
	Gas	279.3	76.8	68.7	58.4	150.3	123.1	15.4	4.0	17.0	61.3	79.3	146.2	**1,079.8**
1972	Coal	86.6	75.1	55.2	55.7	30.8	43.1	64.3	67.1	43.9	77.8	74.4	94.7	**768.7**
	Oil	1.6	'	'	0.0	'	'	'	'	'	0.9	0.2	14.6	**17.5**
	Gas	83.1	54.0	64.0	40.9	49.1	74.4	100.1	95.2	50.8	91.7	224.7	289.4	**1,217.4**
1973	Coal	85.6	69.0	76.3	92.1	94.3	26.0	50.9	91.6	53.0	74.7	87.6	91.5	**892.6**
	Oil	1.8	0.2	0.1	9.2	24.8	0.4	8.1	18.4	0.2	50.1	38.8	0.1	**152.2**
	Gas	326.3	233.7	198.4	185.3	177.8	99.8	0.0	191.0	166.0	271.8	178.0	139.3	**2,167.4**
1974	Coal	79.8	78.3	73.6	65.1	61.2	18.8	63.4	72.9	77.5	83.7	89.5	90.8	**854.6**
	Oil	10.6	'	'	'	0.3	'	'	'	'	'	'	2.9	**14.0**
	Gas	206.6	92.8	109.6	106.7	69.8	54.7	7.2	51.5	55.5	111.8	82.8	89.0	**1,038.0**
1975	Coal	83.2	78.7	88.3	88.8	76.4	47.3	61.8	70.8	59.3	84.5	145.8	176.6	**1,061.3**
	Oil	1.9	'	'	'	0.1	'	'	'	14.2	17.8	10.1	18.3	**62.6**
	Gas	148.0	113.5	90.5	51.4	50.0	64.0	171.3	104.9	105.0	56.6	47.6	70.6	**1.073.3**
1976	Coal	193.1	175.6	179.8	140.8	91.8	94.6	145.7	146.8	268.2	326.1	287.9	323.1	**2,373.7**
	Oil	6.3	6.2	5.2	6.3	1.0	7.6	11.2	10.2	5.4	7.3	9.4	4.5	**81.1**
	Gas	58.7	47.5	51.5	39.2	28.5	43.6	70.4	70.4	49.8	113.3	61.1	74.5	**708.5**

TABLE 2.7 (continued)

Year	FUEL	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1977	Coal	315.1	188.7	192.7	262.7	188.1	266.3	288.2	286.0	320.2	245.9	284.8	357.8	**3,196.7**
	Oil	9.6	3.9	10.8	72.0	27.3	7.1	24.7	23.0	1.1	3.5	6.6	5.6	**195.3**
	Gas	87.6	38.8	56.9	106.7	36.8	45.1	119.7	229.2	35.5	75.2	73.1	48.7	**953.3**
1978	Coal	281.2	305.8	267.9	170.8	176.2	194.1	229.7	300.2	287.2	327.9	297.0	346.1	**3,184.2**
	Oil	12.8	4.8	5.2	9.3	9.6	10.4	7.8	10.3	5.5	6.0	8.7	7.8	**98.1**
	Gas	48.0	71.9	40.5	52.7	35.8	9.4	50.6	55.4	85.4	103.7	156.1	199.9	**909.4**
1979	Coal	325.0	278.8	298.5	197.4	184.4	284.0	268.2	337.2	318.7	328.5	320.6	319.9	**3,461.4**
	Oil	39.8	20.1	8.4	4.2	15.6	14.4	11.4	5.3	7.9	7.7	7.0	4.7	**146.5**
	Gas	104.0	151.8	88.2	36.2	55.9	77.8	170.4	270.2	297.0	447.0	271.1	350.9	**2,320.4**
1980	Coal	317.2	295.6	314.7	207.8	112.9	88.0	304.9	341.0	390.0	326.0	324.0	330.0	**3,351.6**
	Oil	7.7	6.3	5.6	1.0	5.2	11.0	6.5	2.0	7.0	2.0	4.0	1.0	**58.6**
	Gas	460.6	435.4	434.8	447.0	12.9	24.1	78.4	533.0	438.0	487.0	482.0	349.0	**4,182.1**
1981	Coal	306.0	309.0	364.0	293.0	123.0	122.0	222.0	310.0	314.0	358.0	293.0	326.0	**3,337.9**
	Oil	5.0	4.0	1.0	3.0	5.0	2.0	6.0	3.0	3.0	1.0	4.0	1.0	**38.5**
	Gas	130.0	260.0	481.0	341.0	21.0	25.0	19.0	51.0	67.0	300.0	252.0	121.0	**2,069.4**
1982	Coal	310.0	212.0	111.0	117.0	109.0	125.0	137.0	243.0	272.0	330.0	311.0	318.0	**2,595.8**
	Oil	2.0	1.0	5.0	1.0	1.0	5.0	2.0	4.0	3.0	2.0	2.0	3.0	**30.6**
	Gas	76.0	68.0	6.0	3.0	1.0	[2]	10.0	22.0	39.0	34.0	40.0	38.0	**337.0**
1983	Coal	271.0	185.0	118.0	96.0	86.0	92.0	121.0	229.0	283.0	334.0	260.0		
	Oil	1.0	1.0	2.0	5.0	1.0	[2]	[2]	8.0	3.0	2.0	2.0		
	Gas	38.0	36.0	6.0	1.0	4.0	2.0	38.0	41.0	39.0	42.0	24.0		

[1] less than 0.1
[2] less than 0.5

NOTES: Beginning in August 1980, DOE changed from reporting in tons, barrels, and thousand cubic feet to reporting in thousand short tons, thousand barrels, and million cubic feet. Accordingly, beginning in August 1980, data are rounded to the nearest thousand short tons, thousand barrels, or million cubic feet.

SOURCES: Federal Energy Regulatory Commission (formerly Federal Power Commission), Form 4 News Releases (1960-76); U.S. Department of Energy, Energy Information Administration, *Electric Power Statistics*, monthly reports for 1977-78 (EIA-0034); U.S. Department of Energy, Energy Information Administration, *Power Production, Fuel Consumption and Installed Capacity Data*, annual report for 1979 (EIA-0049); U.S. Department of Energy, Energy Information Administration, *Preliminary Power Production, Fuel Consumption and Installed Capacity Data*, monthly reports for January-July 1980 (EIA-0005); U.S. Department of Energy, Energy Information Administration, *Electric Power Monthly*, monthly reports for August 1980 through November 1983 (EIA-0226).

Annual totals are revised based on information in the U.S. Department of Energy, Energy Information Administration, *Electric Power Annual* publications (EIA-0348).

TABLE 2.8
TYPICAL ELECTRIC BILLS FOR RESIDENTIAL SERVICE, 1974-83
(dollars)

As of January 1 of the Year	Utility	MONTHLY BILLS 100 kWh	250 kWh	500 kWh	750 kWh	1,000 kWh
1974[1]	**Montana Average**		**8.59**	**12.?1**	**16.31**	**20.1?**
	U.S. Average		**9.47**	**14.10**	**19.14**	**24.85**
1975	Glacier Electric Cooperative, Inc.	4.70	7.88	10.75	13.63	16.50
	Marias River Electric Cooperative, Inc.	4.00	7.00	10.00	12.50	15.00
	Montana-Dakota Utilities[2]	4.38	8.25	14.50	19.13	23.26
	Montana-Dakota Utilities[3]	5.88	9.75	16.00	20.63	24.76
	Montana Power Company	4.95	8.84	12.71	16.59	20.46
	Pacific Power and Light Company	3.50	6.00	8.10[4]	10.10[4]	12.85[4]
	Montana Average		**8.60**	**12.53**	**16.33**	**20.13**
	U.S. Average		**11.49**	**17.93**	**24.72**	**32.29**
1976	Glacier Electric Cooperative, Inc.	4.70	7.88	10.75	13.63	16.50
	Marias River Electric Cooperative, Inc.	4.95	8.84	12.71	16.59	20.46
	Montana-Dakota Utilities[2]	4.38	8.25	14.50	19.13	23.26
	Montana-Dakota Utilities[3]	5.88	9.75	16.00	20.63	24.76
	Montana Power Company	4.95	8.84	12.71	16.59	20.46
	Pacific Power and Light Company	3.50	6.00	8.10[4]	10.10[4]	12.85[4]
	Montana Average		**8.60**	**12.53**	**16.33**	**20.13**
	U.S. Average		**12.06**	**19.26**	**26.78**	**34.85**
1977	Glacier Electric Cooperative, Inc.	4.70	7.88	10.75	13.63	16.50
	Marias River Electric Cooperative, Inc.	4.00	7.00	10.00	12.50	15.00
	Montana-Dakota Utilities[2]	4.92	9.61	17.22	23.21	28.70
	Montana-Dakota Utilities[3]	6.42	11.11	18.72	24.71	30.20
	Montana Power Company	4.95	8.84	12.71	16.59	20.46
	Pacific Power and Light Company	3.02	5.31	9.12[4]	12.93[4]	16.74[4]
	Montana Average		**8.66**	**12.79**	**16.80**	**20.77**
	U.S. Average		**12.85**	**20.86**	**29.22**	**38.15**
1978	Glacier Electric Cooperative, Inc.	4.70	7.88	10.75	13.63	16.50
	Marias River Electric Cooperative, Inc.	4.20	7.35	10.60	13.35	16.10
	Montana-Dakota Utilities[5]	8.00	14.00	21.50	29.00	36.50
	Montana-Dakota Utilities[3]	9.50	15.50	23.00	30.50	38.00
	Montana Power Company	5.99	10.69	15.39	20.09	24.79
	Pacific Power and Light Company	3.03	5.33	9.17[4]	13.00[4]	16.83[4]
	Montana Average		**10.56**	**15.39**	**20.21**	**25.03**
	U.S. Average		**13.47**	**22.19**	**31.23**	**40.98**
1979	Glacier Electric Cooperative, Inc.	4.70	7.88	10.75	13.63	16.50
	Marias River Electric Cooperative, Inc.	4.60	8.35	12.60	16.35	20.10
	Montana-Dakota Utilities[2]	8.00	14.00	21.50	29.00	36.50
	Montana-Dakota Utilities[3]	9.50	15.50	23.00	30.50	38.00
	Montana Power Company	4.72	8.41	14.58	20.74	26.90
	Pacific Power and Light Company	3.91	6.78	11.56	16.33	21.11
	Average for Rural Electric Cooperatives	**NA**	**11.42**	**17.23**	**22.60**	**27.64**
	Montana Average	**NA**	**8.73**	**14.86**	**20.98**	**27.10**
	U.S. Average	**NA**	**13.86**	**23.05**	**32.72**	**43.12**

TABLE 2.8 (continued)

As of January 1 of the Year	Utility	MONTHLY BILLS 250 kWh	500 kWh	750 kWh	1,000 kWh	2,500 kWh
1980	Montana-Dakota Utilities[2]	13.84	21.34	28.84	36.34	81.34
	Montana-Dakota Utilities[6]	15.34	22.84	30.34	37.84	82.84
	Montana Power Company	8.45	14.65	20.85	27.05	64.26
	Pacific Power and Light Company	6.78	11.66	16.33	21.11	49.78
	Average for Rural Electric Cooperatives	**12.46**	**18.15**	**23.82**	**29.47**	**58.33**
	Montana Average	**8.77**	**14.99**	**21.20**	**27.41**	**64.71**
	U.S. Average	**15.29**	**27.80**	**36.94**	**48.79**	**110.91**
1981	Montana-Dakota Utilities[2]	14.56	22.78	31.00	39.22	88.55
	Montana-Dakota Utilities[6]	16.06	24.28	32.50	40.72	90.05
	Montana Power Company	10.04	17.41	24.78	32.16	76.39
	Pacific Power and Light Company	7.56	13.12	18.68	24.24	57.60
	Average for Rural Electric Cooperatives	**12.81**	**19.61**	**25.99**	**32.32**	**66.72**
	Montana Average	**10.24**	**17.57**	**24.90**	**32.23**	**76.20**
	U.S. Average	**17.76**	**32.61**	**43.99**	**58.16**	**133.90**
1982	Montana-Dakota Utilities[2]	13.91	30.49	47.74	64.99	168.49
	Montana-Dakota Utilities[6]	15.41	31.99	49.24	66.49	169.99
	Montana Power Company	9.90	17.17	24.43	31.69	75.27
	Pacific Power and Light Company[7]	3.98	10.12	16.80	23.48	79.47
	Pacific Power and Light Company[8]	3.98	10.12	18.24	27.33	81.86
	Average for Private Utilities	**9.84**	**17.69**	**25.61**	**33.53**	**81.98**
	Average for Rural Electric Cooperatives[9]	**13.95**	**21.65**	**28.35**	**36.66**	**79.00**
	Montana Average	**9.84**	**17.69**	**25.61**	**33.53**	**81.98**
	U.S. Average	**19.82**	**36.96**	**50.07**	**66.39**	**155.69**
1983	Montana-Dakota Utilities[2]	13.91	30.49	47.74	64.99	168.49
	Montana-Dakota Utilities[6]	15.41	31.99	49.24	66.49	169.99
	Montana Power Company	12.23	21.18	30.12	39.07	92.76
	Pacific Power and Light Company[7]	5.36	13.51	22.37	31.22	105.23
	Pacific Power and Light Company[8]	5.36	13.51	24.14	35.96	106.87
	Average for Private Utilities	**11.95**	**21.38**	**30.90**	**40.42**	**98.73**
	Average for Rural Electric Cooperatives[9]	**13.95**	**21.65**	**28.35**	**36.66**	**79.00**
	Montana Average	**11.95**	**21.38**	**30.90**	**40.42**	**98.73**
	U.S. Average	**20.72**	**38.35**	**52.74**	**69.96**	**160.22**

NA Not Available

[1] Data for 1974 obtained from 1975 report; digits replaced by question marks are illegible in the source document.
[2] Data computed for service from overhead distribution system—majority of customers.
[3] Data computed for service from underground distribution system—minority of customers.
[4] Rate used may limit hours of use of water heating devices.
[5] Data computed for service from overhead distribution system—minority of users.
[6] Data computed for service from underground distribution system—majority of customers.
[7] Data based on rates effective during utility-specified winter period.
[8] Data based on rates effective during utility-specified summer period.
[9] Averages shown are weighted by the number of billed customers.

NOTE: The kilowatt-hour usage categories represent broad monthly residential consumption patterns.

From 1975-79, the usage categories were as follows:
100 kWh: lighting, small appliances, and refrigeration
250 kWh: lighting, appliances, refrigeration, and cooking
500, 750, and 1,000 kWh: lighting, appliances, refrigeration, cooking, and water heating.

Beginning in 1980, the 100 kWh usage category was deleted, the 2,500 kWh category was added, and the consumption categories were redefined as follows:
250 and 500 kWh: lighting, appliances, refrigeration, and cooking
750 and 1,000 kWh: lighting, appliances, refrigeration, cooking, and water heating
2,500 kWh: lighting, appliances, refrigeration, cooking, water heating, and/or space heating

SOURCES: Federal Power Commission, *Typical Electric Bills*, annual reports for 1975-76; U.S. Department of Energy, Energy Information Administration, *Typical Electric Bills*, annual reports for 1977-83 (EIA-0040).

The average bills for rural electric cooperatives for the years 1979-81 were obtained from U.S. Department of Agriculture, Rural Electrification Administration, *Statistical Report, Rural Electric Borrowers*, annual reports for 1979-81 (REA bulletin number 1-1).

TABLE 2.9
TYPICAL ELECTRIC BILLS FOR COMMERCIAL SERVICE, 1975-83
(dollars)

Billing Demand: / Consumption:	3 kW 375 kWh	6 kW 750 kWh	12 kW 1,500 kWh	30 kW 6,000 kWh	40 kW 10,000 kWh	50 kW 12,500 kWh	100 kW 30,000 kWh
Date							
January 1, 1975	15.32	29.46	60.39	178.88	238.78		
January 1, 1976	15.32	29.46	60.39	178.88	238.78		
January 1, 1977	15.32	29.46	60.39	178.88	238.78		
January 1, 1978	18.53	35.63	73.05	216.59	289.19		
January 1, 1979	17.81	34.32	70.25	212.61	289.35		
January 1, 1980		34.50	70.62	213.73	290.87	343.66	664.17
January 1, 1981		41.01	83.95	254.07	345.77	408.52	789.53
January 1, 1982		40.41	82.72	250.34	340.70	402.53	777.95
January 1, 1983		50.22	102.82	311.16	423.47	500.32	966.94

NOTE: Based on data for the Montana Power Company.

SOURCE: Federal Power Commission, *Typical Electric Bills*, annual reports for 1975-76; U.S. Department of Energy, Energy Information Administration, *Typical Electric Bills,* annual reports for 1977-83 (EIA-0040).

TABLE 2.10
TYPICAL ELECTRIC BILLS FOR INDUSTRIAL SERVICE, 1975-83
(dollars)

Billing Demand: / Consumption:	75 kW 15 MWh	75 kW 30 MWh	150 kW 30 MWh	150 kW 60 MWh	300 kW 60 MWh	300 kW 120 MWh	500 kW 100 MWh	500 kW 200 MWh	1,000 kW 200 MWh	1,000 kW 400 MWh	5,000 kW 1,500 MWh	5,000 kW 2,500 MWh
Date												
January 1, 1975	339	500	583	850	1,049	1,517	1,671	2,407	3,226	4,632		
January 1, 1976	339	500	583	850	1,049	1,517	1,671	2,407	3,226	4,632		
January 1, 1977	339	500	583	850	1,049	1,517	1,671	2,407	3,226	4,632		
January 1, 1978	410	605	706	1,029	1,270	1,836	2,022	2,912	3,902	5,602		
January 1, 1979	413	630	721	1,096	1,314	1,992	2,105	3,186	4,082	6,172		
January 1, 1980			725	1,102	1,321	2,002	2,116	3,203	4,104	6,204	25,145	35,285
January 1, 1981			862	1,310	1,571	2,380	2,516	3,808	4,878	7,375	29,891	41,945
January 1, 1982			849	1,291	1,548	2,346	2,479	3,752	4,807	7,267	29,453	41,330
January 1, 1983			1,056	1,604	1,924	2,915	3,081	4,663	5,974	9,033	36,608	51,370

NOTES: Based on data for the Montana Power Company.

Energy is metered on secondary side of utility-owned transformers.

SOURCE: Federal Power Commission, *Typical Electric Bills*, annual reports for 1975-76; U.S. Department of Energy, Energy Information Administration, *Typical Electric Bills*, annual reports for 1977-83 (EIA-0040).

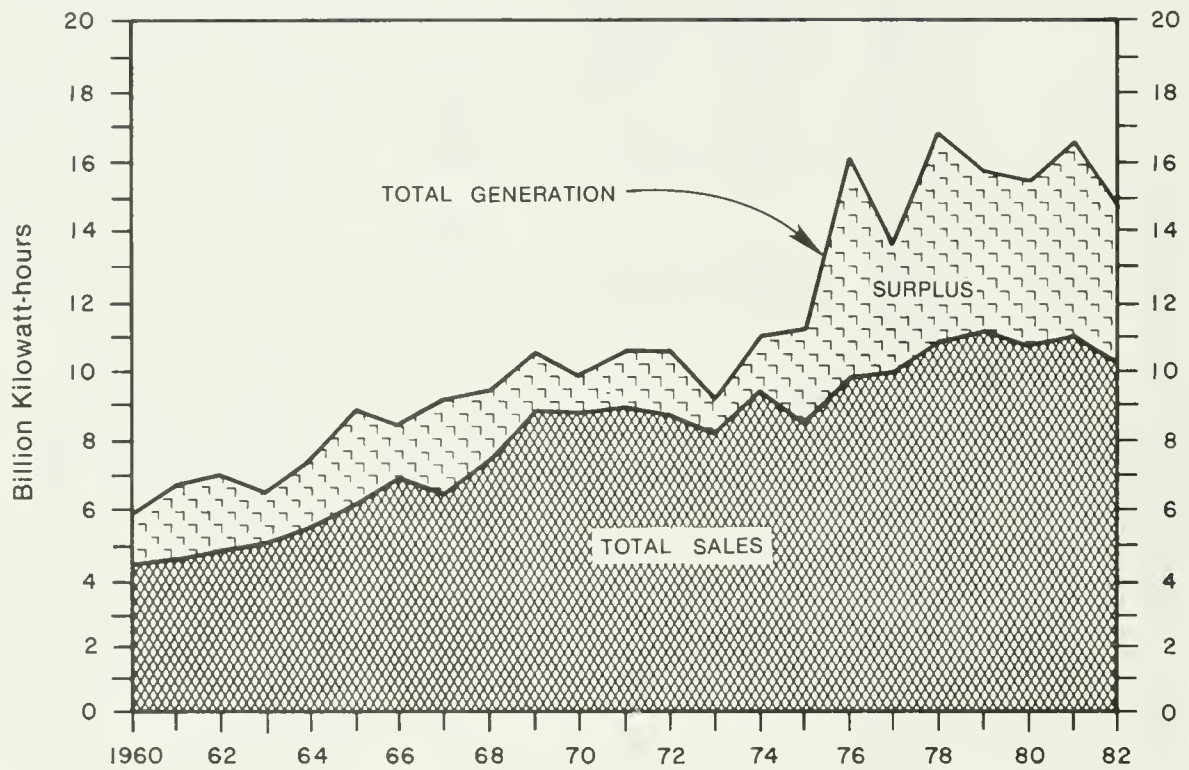

FIGURE 2.3 ANNUAL GENERATION AND SALES OF ELECTRICITY, 1960-82

SOURCES: Generation: Table 2.2.
Sales: Table 2.3.

3

COAL

HIGHLIGHTS

- One-quarter of the U. S. demonstrated reserve base of coal is in Montana. This includes 57 percent of the subbituminous coal and 35 percent of the lignite demonstrated reserve base.
- Surface mines in Montana produced 28,660,284 tons of subbituminous coal and lignite in 1983, up 3 percent from the previous year.
- Since 1974, Big Horn County has been the leading coal-producing county in Montana. Big Horn County produced 15,352,986 tons of coal in 1982, followed closely by Rosebud County with 12,355,653 tons. The Rosebud coal bed, which encompasses these counties, was the twelfth largest coal bed in the United States in terms of its 1981 coal production.[1]
- The 1982 average mine price for Montana coal was $13.51 per ton, up $1.82 per ton from the previous year.
- Approximately 90 percent of the coal mined in Montana is shipped out of state to steam-electric plants. In 1982 more than one-third of the coal was shipped to utilities in Minnesota.
- Of the 2.8 million tons of coal consumed in Montana in 1982, 93 percent was used to generate electricity.

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[1]SOURCE: U.S. Department of Energy, Energy Information Administration, *Coal Production*, annual report for 1981 (EIA-0118).

TABLE 3.1
DEMONSTRATED RESERVE BASE[1] OF COAL BY RANK
January 1, 1982
(million short tons)

State	Anthracite	Bituminous	Subbituminous	Lignite	TOTAL
Alabama		4,118.9		1,083.0	5,201.9
Alaska		697.5	5,441.0	14.0	6,152.6
Arizona		381.9			381.9
Arkansas	104.1	288.4		25.7	418.1
Colorado	25.5	9,044.7	3,962.7	4,189.9	17,222.8
Georgia		3.6			3.6
Idaho		4.4			4.4
Illinois		78,769.3			78,769.3
Indiana		10,510.0			10,510.0
Iowa		2,195.9			2,195.9
Kansas		990.9			990.9
Kentucky, Eastern[2]		12,564.8			12,564.8
Kentucky, Western[2]		20,947.0			20,947.0
Maryland		809.9			809.9
Michigan		127.7			127.7
Missouri		6,056.2			6,056.2
Montana		**1,385.4**	**103,198.7**	**15,764.5**	**120,348.6**
New Mexico	2.3	2,053.1	2,647.1		4,702.5
North Carolina		10.7			10.7
North Dakota				9,908.5	9,908.5
Ohio		18,944.8			18,944.8
Oklahoma		1,623.8			1,623.8
Oregon			17.5		17.5
Pennsylvania	7,079.2	22,926.0			30,005.2
South Dakota				366.1	366.1
Tennessee		952.8			952.8
Texas				13,480.3	13,480.3
Utah		6,422.6	1.1		6,423.7
Virginia	125.5	3,196.7			3,322.2
Washington		303.7	1,157.2	8.1	1,469.0
West Virginia		39,346.8			39,346.8
Wyoming		4,447.5	65,227.1		69,674.6
U.S. TOTAL	**7,336.6**	**249,125.0**	**181,652.4**	**44,840.0**	**482,954.0**

[1] Includes measured and indicated resource categories as defined by the Energy Information Administration and represents 100 percent of the coal in place.

[2] Eastern Kentucky is in the Appalachian coal producing region; western Kentucky is in the U.S. interior coal producing region. Because coal reserves are calculated by region, these figures are shown separately.

NOTE: The coal reserve base consists of coal in the ground that was considered to be technically and economically minable on January 1, 1982. The amount of coal that can be recovered from the reserve base is termed the reserve. Recoverability ranges from 40 to 90 percent, depending on the characteristics of the coalbed, the mining method, and restraints imposed on the mining operations by natural and manmade features and restrictions. On a national basis, at least half of the coal reserve base, more than 200 billion tons, was estimated to be recoverable.

State geological and mineral resource surveys and other geological reports were used to update the U.S. Department of Energy, Energy Information Administration's *Demonstrated Reserve Base of Coal in the United States on January 1, 1980* (EIA-0280). The update accounts for (1) depletion due to mining during 1980 and 1981, (2) revisions based on new data sources determined to be suitable under demonstrated reserve base (DRB) criteria, and (3) adjustments using existing data sources in context with changes in DRB criteria or basic data interpretations.

SOURCE: U.S. Department of Energy, Energy Information Administration, *Coal Production*, annual report for 1982 (EIA-0118).

TABLE 3.2
COAL PRODUCTION BY COMPANY, 1978-83
(tons)

Company	1978	1979	1980	1981	1982	1983
Beartooth Coal Company[1]		715	7,321			
Coal Creek Mining Company	8,245	29,866	64,398	64,142	16,608	
Decker Coal Company[2]						
East Pit		5,897,433	5,576,607	5,350,113	4,914,970	5,040,018
West Decker Mine	9,167,638	7,067,372	5,616,695	5,331,626	4,884,920	5,308,799
K.R.C.M. Company[3]						
(Knife River Coal Mine)	288,708	305,143	305,578	204,492	171,556	206,543
Long Construction Company						
(Western Energy Company)	10,565,750	11,725,558	10,401,972	10,352,966	9,424,857	9,544,062
Morrison-Knudsen Company, Inc.						
(Westmoreland Resources)	4,549,558	4,949,759	4,905,262	4,450,296	4,158,578	3,868,844
P.M. Coal Mine	9,877	10,749	11,189	7,404	15,141	11,655
Peabody Coal Company	2,080,414	2,457,633	2,964,359	3,193,570	2,891,428	2,571,861
Spring Creek Coal Company						
(NERCO; Pacific Power and Light)			118,660	4,368,885	1,352,181	2,102,606
Storm King Coal Mining Company[4]	8,984	9,464	8,571	8,165	8,062	5,896
TOTAL	**26,679,174**	**32,453,692**	**29,980,612**	**33,331,659**	**27,838,301**	**28,660,284**

[1] Underground mine.

[2] Production for 1978 is reported as the West Decker Mine.

[3] Lignite mine.

[4] Prior to a change in ownership in June 1983, this was called the Divide Coal Mining Company.

SOURCE: Montana Department of Labor and Industry, Workers' Compensation Division (1978-83).

TABLE 3.3
COAL PRODUCTION BY COUNTY, 1950-82
(tons)

Year	Big Horn	Carbon	Cascade	Custer	Dawson	Fallon	Garfield	McCone
1950		198,781	21,306	5,618	7,657		563	1,646
1951		152,095	18,106	2,447	7,657	93	500	
1952		122,771	2,278	1,441	6,326		413	
1953		56,942	1,086	940	4,579			
1954		19,716	2,225	1,080	3,006			59
1955		20,017	1,252	233	3,780			
1956		17,025	2,132		1,819			25
1957		15,053	2,095		2,734			965
1958		10,906	1,816		2,393			513
1959		12,814	1,923		2,502			279
1960		11,085	1,650		1,920			366
1961		9,962	1,477		1,313			1,091
1962		11,363	1,444		1,242			468
1963		12,514	570		1,477			335
1964		12,023			987			316
1965		25,684			1,217			142
1966		52,811			767			254
1967					770			196
1968					266			163
1969					160			165
1970	74,856				744			229
1971					127			
1972	792,949				340			
1973	4,159,287				242			
1974	8,332,038				373			
1975	13,331,433							
1976	14,291,542							
1977	14,768,368							
1978	13,628,587							
1979	18,001,299	545						
1980	16,066,363	2,650						
1981	19,571,777	16						
1982	15,352,986	2						

TABLE 3.3 (continued)

Year	Musselshell	Powder River	Prairie	Richland	Rosebud	Sheridan	Valley	STATE TOTAL
1950	523,582	3,838	851	12,072	1,708,869	8,882	156	2,493,821
1951	593,030	3,772	1,950	12,956	1,488,300		329	2,281,235
1952	502,533	2,573	1,213	14,589	1,406,321	6,862	99	2,067,419
1953	370,745	1,273	900	10,478	1,421,140			1,868,083
1954	345,474	2,160	213	10,156	1,083,311	7,406		1,474,806
1955	366,086			1,444	795,955	7,541		1,196,308
1956	347,126	1,858	336	5,420	952,080	6,601		1,334,422
1957	199,652	2,557	614	1,527	164,311	5,195		394,703
1958	220,606	4,711	307	76,218	19,241	2,125		338,836
1959	135,117	1,517	313	177,972		5,429		337,866
1960	91,819	820		188,820		4,793		301,273
1961	75,060	1,760		264,108		4,077		358,848
1962	48,565	2,080		297,013		3,675		365,850
1963	31,044	2,258		285,697		2,653		336,548
1964	31,836	2,535		294,463		2,476		344,636
1965	47,592	2,107		298,315		2,191		377,248
1966	32,752	1,787		325,348		1,691		415,410
1967	33,481	2,128		326,757		1,177		364,509
1968	31,637	1,853		329,022	192,029	301		555,271
1969	30,540	2,047		306,833	685,140			1,024,885
1970	26,675	3,053		321,908	3,089,693			3,517,158
1971	112,252	2,660		325,475	6,656,612			7,097,126
1972	46,460	1,727		320,975	7,101,954			8,264,405
1973	29,837	1,444		312,785	6,225,424			10,729,019
1974	20,669	1,001		329,590	5,440,384			14,124,055
1975	16,524	1,862		300,053	8,511,226			22,161,098
1976	15,709	1,614		314,814	11,662,052			26,285,731
1977	15,727	16,015		311,390	12,117,552			27,229,052
1978	18,478	8,246		302,062	12,641,342			26,598,715
1979		29,875		303,528	14,203,545			32,538,792
1980	20,321	64,399		304,712	13,379,283			29,837,728
1981	8,165			203,886	13,571,946			33,355,790
1982	23,118	16,627		173,695	12,355,653			27,922,081

SOURCE: Montana Department of Revenue, Property Assessment Division (1950-80); Montana Department of Revenue, Natural Resource and Corporation Tax Division (1981-82).

TABLE 3.4
AVERAGE MINE PRICE OF COAL BY COUNTY, 1950-82
(dollars per ton)

Year	Big Horn	Carbon	Cascade	Custer	Dawson	Fallon	Garfield	McCone
1950		4.77	6.47	3.23	3.00		3.00	2.04
1951		5.00	1.43	3.00	2.48	2.00	2.00	
1952		5.04	9.59	3.95	2.00		2.00	
1953		5.47	10.90	4.00	2.00			
1954		7.48	6.80	4.13	3.00			3.00
1955		3.50	8.06	1.00	1.00			
1956		7.25	6.90		1.10			1.12
1957		7.50	7.30		1.00			1.00
1958		7.56	7.75		1.00			1.00
1959		7.53	7.55		1.00			1.00
1960		7.45	7.67		1.00			1.00
1961		7.66	7.82		1.00			2.16
1962		7.69	7.79		1.00			3.59
1963		8.08	7.74		1.00			1.88
1964		8.26			1.00			1.75
1965		6.76			1.00			4.00
1966		6.49			1.00			3.08
1967					1.00			3.51
1968					1.00			4.96
1969					1.00			1.00
1970	4.62				1.00			3.57
1971					1.00			
1972	3.47				1.00			
1973	3.93				1.00			
1974	4.53				1.00			
1975	5.68							
1976	6.69							
1977	6.89							
1978	8.23							
1979	13.56	20.99						
1980	13.29	21.03						
1981	13.88	20.69						
1982	16.63	21.00						

TABLE 3.4 (continued)

Year	Musselshell	Powder River	Prairie	Richland	Rosebud	Sheridan	Valley	STATE AVERAGE
1950	4.50	2.00	2.00	3.52	1.32	3.00	3.00	2.34
1951	4.14	2.00	2.00	3.39	1.65		3.50	2.54
1952	4.35	2.00	2.00	2.49	1.98	3.30	3.50	2.76
1953	4.75	3.00	3.00	3.80	2.00			2.66
1954	4.25	3.00	3.00	4.09	2.00	3.50		2.62
1955	4.60			3.00	2.00	3.55		2.83
1956	4.95	1.10	1.10	4.30	1.95	3.56		2.83
1957	5.38	1.00	1.00	4.33	2.95	3.58		4.35
1958	4.03	1.00	1.00	1.96	2.83	5.57		3.55
1959	5.44	1.00	1.00	1.93		3.80		3.59
1960	6.40	1.00		1.94		3.80		3.56
1961	6.32	1.00		1.93		3.93		3.04
1962	4.24	1.00		1.92		4.00		2.45
1963	6.29	1.00		1.92		4.00		2.57
1964	6.58	1.00		1.92		4.00		2.58
1965	6.47	1.00		1.93		4.32		2.83
1966	6.98	1.00		1.94		4.31		2.91
1967	7.07	1.00		1.95		4.50		2.42
1968	7.58	1.00		1.95	1.63	4.50		2.15
1969	8.08	1.00		2.02	1.81			2.07
1970	6.73	1.00		2.12	1.68			1.82
1971	4.29	1.00		2.25	1.73			1.79
1972	5.41	6.00		2.43	1.83			2.03
1973	9.31	7.13		2.58	2.06			2.83
1974	6.62	9.41		3.39	2.80			3.84
1975	10.00	10.00		5.02	3.85			4.97
1976	18.31	9.74		6.35	4.49			5.72
1977	20.84	7.86		6.92	4.48			5.83
1978	22.21	11.71		7.80	5.25			6.82
1979		8.70		8.60	6.17			10.28
1980	26.80	7.94		10.60	6.96			10.43
1981	27.94			12.30	8.52			11.69
1982	29.74	10.73		12.95	9.60			13.51

NOTE: In each county, average price was calculated by dividing the gross value of production by the total production for that county during the year in which the coal was mined.

SOURCE: Montana Department of Revenue, Property Assessment Division (1950-80); Montana Department of Revenue, Natural Resource and Corporation Tax Division (1981-82).

TABLE 3.5
COAL PRODUCTION AND AVERAGE MINE PRICE BY RANK OF COAL, 1950-82

Year	PRODUCTION (thousand tons)			AVERAGE MINE PRICE (dollars per ton)		
	Subbituminous	Lignite	TOTAL	Subbituminous	Lignite	TOTAL
1950	2,468	52	2,520	2.30	3.37	2.33
1951	2,310	35	2,345	2.61	3.51	2.63
1952	2,039	31	2,070	2.80	3.70	2.81
1953	1,848	25	1,873	2.64	3.77	2.66
1954	1,491	NA	NA	2.79	NA	NA
1955	1,217	30	1,247	3.01	3.82	3.03
1956	820	26	846	4.11	3.70	4.10
1957	387	26	413	5.33	3.80	5.23
1958	211	94	305	5.94	2.34	4.84
1959	152	193	345	7.06	2.08	4.28
1960	113	200	313	6.87	2.06	3.79
1961	97	274	371	6.76	2.01	3.26
1962	78	304	382	6.90	1.99	2.98
1963	53	290	343	7.51	1.95	2.82
1964	46	300	346	7.40	1.95	2.68
1965	63	301	364	7.24	1.96	2.88
1966	91	328	419	7.10	1.96	3.08
1967	65	300	365	NA	NA	NA
1968	189	330	519	3.12	1.89	2.33
1969	722	308	1,030	2.18	2.03	2.13
1970	3,124	323	3,447	1.83	2.13	1.86
1971	6,737	327	7,064	1.79	2.27	1.82
1972	7,899	322	8,221	2.01	2.45	2.02
1973	10,411	314	10,725	2.83	2.60	2.82
1974	13,775	331	14,106	3.91	3.00	3.90
1975	21,620	520	22,140	5.06	5.04	5.06
1976	25,919	312	26,231	NA	NA	4.90
1977	29,020	300	29,320	NA	NA	5.30
1978	26,290	310	26,600	NA	NA	7.37
1979	32,343	333	32,676	w	w	9.76
1980	29,578	369	29,948	w	w	10.50
1981	33,341	204	33,545	w	w	12.14
1982	27,708	174	27,882	w	w	13.57

NA Not available.

w Withheld to avoid disclosure of individual company data.

SOURCES: U.S. Bureau of Mines (1950-76); U.S. Department of Energy, Energy Information Administration (1977-78); U.S. Department of Energy, Energy Information Administration, *Coal Production*, annual reports for 1979-82 (EIA-0118).

TABLE 3.6
RECEIPTS OF MONTANA COAL AT ELECTRIC UTILITY PLANTS,[1] 1973-82
(thousand short tons)

Year	RECEIVED AT MONTANA UTILITIES			Received at Out-of-State Utilities	TOTAL
	Subbituminous	Lignite	Montana Total		
1973			**882.0**	9,741.0	**10,623.0**
1974			**822.0**	13,114.0	**13,936.0**
1975			**1,197.0**	20,180.0	**21,377.0**
1976			**2,316.0**	22,642.0	**24,958.0**
1977			**3,223.0**	22,730.0	**25,954.0**
1978	3,033.0	298.3	**3,331.3**	22,976.0	**26,307.3**
1979	3,207.0	303.9	**3,510.9**	24,612.8	**28,123.7**
1980	3,071.0	292.8	**3,363.8**	24,560.9	**27,924.7**
1981	3,129.0	210.1	**3,339.1**	26,633.8	**29,972.9**
1982	2,424.0	177.1	**2,601.1**	25,439.2	**28,040.3**

[1] Plants of 25-megawatt capacity or larger.

SOURCES: Federal Energy Regulatory Commission (formerly the Federal Power Commission), Form 423 (1973-77); U.S. Department of Energy, Energy Information Administration, *Cost and Quality of Fuels for Electric Utility Plants*, annual reports for 1978-82 (EIA-0191).

TABLE 3.7
DESTINATION OF MONTANA COAL DELIVERED TO STEAM-ELECTRIC PLANTS,[1] 1978-82
(thousand short tons)

State of Destination	1978	1979	1980	1981	1982
Illinois	5,688.2	4,106.4	3,693.5	2,669.0	2,145.6
Indiana	1,202.0	813.0	1,157.0	735.0	1,504.0
Iowa	223.6	180.4	207.3	256.6	213.4
Kansas		5.8			
Kentucky	50.4				
Michigan	3,309.0	3,727.0	3,426.0	5,398.0	3,702.5
Minnesota	10,007.1	11,449.5	10,737.7	10,664.4	10,038.7
Montana	**3,331.3**	**3,510.9**	**3,363.8**	**3,339.1**	**2,601.1**
Nebraska			41.4		
North Dakota		3.3			
Texas		1,609.0	2,722.7	4,385.4	5,372.7
Wisconsin	2,495.7	2,718.5	2,575.3	2,525.4	2,462.3
TOTAL	**26,307.3**	**28,123.7**	**27,924.7**	**29,972.9**	**28,040.3**

[1] Plants 25-megawatts or greater.

SOURCE: U.S. Department of Energy, Energy Information Administration, *Cost and Quality of Fuels for Electric Utility Plants,* annual reports for 1978-82 (EIA-0191).

TABLE 3.8
DISTRIBUTION OF COAL FOR USE IN MONTANA, 1974-82
(thousand short tons)

Year	Electric Utilities	Residential and Commercial	Industrial	TOTAL
1974	843	9	55	**907**
1975	1,203	7	42	**1,252**
1976	2,452	5	108	**2,565**
1977	3,225	1	182	**3,408**
1978	3,334	4	183	**3,522**
1979	3,513	3	214	**3,731**
1980	3,462	14	182	**3,658**
1981	3,318	7	253	**3,578**
1982	2,619	9	197	**2,824**

SOURCES: U. S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, *Bituminous Coal and Lignite Distribution,* annual reports for 1974-76; U. S. Department of Energy, Energy Information Administration, *Bituminous Coal and Lignite Distribution,* quarterly reports for 1977; U. S. Department of Energy, Energy Information Administration, *Bituminous Coal and Lignite Distribution,* annual report for 1978 (EIA-0125); U. S. Department of Energy, Energy Information Administration, *Bituminous and Subbituminous and Lignite Distribution,* annual report for 1979 (EIA-0125); U. S. Department of Energy, Energy Information Administration, *Coal Distribution,* annual reports for 1980-82 (EIA-0125).

4

NATURAL GAS

HIGHLIGHTS

- Proved reserves of natural gas were estimated by the U. S. Department of Energy to be 870 billion cubic feet as of December 31, 1982.
- Montana wells produced 51 billion cubic feet of natural gas in 1982, approximately the same as in 1981.
- In 1982 the state's natural gas utilities reported sales of 51 billion cubic feet. Nearly three-fourths of this was used by residential and commercial customers.
- Residential gas customers paid an average of $4.46 per thousand cubic feet (Mcf), while commercial customers paid an average of $4.87 per Mcf and industrial customers paid an average of $5.49 per Mcf in 1982. The statewide average over all consuming sectors was $4.83 per Mcf.
- The average residential customer consumed 121,000 cubic feet of natural gas at a cost of $538 in 1982.

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NOTE: All volumetric data presented in Chapter 4 are expressed using a pressure base of 14.73 pounds per square inch absolute (psia) at 60 degrees Fahrenheit. Conversions to this uniform pressure base were made by the Energy Division, Montana Department of Natural Resources and Conservation, where necessary.

TABLE 4.1
YEAR-END NATURAL GAS PROVED RESERVES, 1950-79
(million cubic feet)

Year	Nonassociated	Associated or Dissolved	Underground Storage	TOTAL GAS
1950	718,722	69,839	4,470	793,031
1951	696,554	119,533	7,522	823,609
1952	693,916	119,631	9,562	823,109
1953	612,965	117,937	28,949	759,851
1954	573,496	116,183	30,122	719,801
1955	560,565	125,067	30,178	715,810
1956	546,049	115,906	30,614	692,569
1957	512,583	119,311	34,914	666,808
1958	508,851	132,295	37,163	678,309
1959	492,162	128,880	40,835	661,877
1960	462,532	105,362	54,883	622,777
1961	435,178	104,319	53,601	593,098
1962	419,128	98,958	82,085	600,171
1963	399,266	103,558	95,307	598,131
1964	384,278	99,287	106,704	590,269
1965	373,440	103,672	118,740	595,852
1966	383,346	102,239	134,765	620,350
1967	550,681	138,454	148,583	837,718
1968	579,572	174,266	157,695	911,533
1969	799,770	147,927	162,511	1,110,208
1970	793,283	141,854	164,786	1,099,923
1971	715,195	127,032	182,334	1,024,561
1972	790,660	92,628	180,748	1,064,036
1973	821,513	85,625	185,311	1,092,449
1974	676,749	81,272	143,239	901,260
1975	686,350	73,912	169,724	929,986
1976	876,452	67,435	162,383	1,106,270
1977	815,862	67,428	160,692	1,043,982
1978	768,683	65,779	157,206	991,668
1979	807,645	63,483	164,963	1,036,091

NOTE Proved reserves are the estimated amounts of natural gas that geologic and engineering data indicate are recoverable from known reservoirs under present economic and operating conditions. Natural gas is classified into two categories based on type of occurrence in reservoirs, as follows:

1 Nonassociated gas is defined as free natural gas not in contact with crude oil in the reservoir.
2 Associated or dissolved gas is the combined volume of natural gas that occurs in crude oil reservoirs either as free gas (associated) or as gas in solution with the crude oil (dissolved).

Since 1973, only the recoverable portion of natural gas in underground storage has been reported.

Joint American Gas Association, Canadian Petroleum Association, and American Petroleum Institute publication of the yearly reserves of natural gas and natural gas liquids ceased after 1979. Rather than develop independent reserve estimates, these organizations now publish the reserve estimates calculated by the U.S. Department of Energy, which are shown in Table 4.1A.

SOURCE American Gas Association, *Gas Facts* (1950-79).

TABLE 4.1A
YEAR-END PROVED RESERVES OF NATURAL GAS AND NATURAL GAS LIQUIDS, 1976-82

Year	Natural Gas (wet after lease separation)[1] (billion cubic feet)	Nonassociated Natural Gas (wet after lease separation)[2] (billion cubic feet)	Associated Dissolved Natural Gas (wet after lease separation)[2] (billion cubic feet)	(Dry) Natural Gas[3] (billion cubic feet)	Natural Gas Liquids (million barrels)
1976		761	45	806	
1977	887	838	49	887[1]	
1978	926	893	33	926	12
1979	837	786	51	825	10
1980	1,308[1]	1,186	122	1,287[1]	16
1981	1,336[1]	1,247	89	1,321[1]	11
1982	870	789	81	847	18

[1] Volumes for 1977 and 1978 were neither fully dry nor fully wet.

[2] Reported on a dry basis prior to 1979.

[3] Estimate is associated with a sampling error (95 percent confidence interval) that exceeds 20 percent of the estimated value.

SOURCES U.S. Department of Energy, Energy Information Administration, *U.S. Crude Oil and Natural Gas Reserves*, annual reports for 1977-78 (EIA-0216). U.S. Department of Energy, Energy Information Administration, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, annual reports for 1979-82 (EIA-0216).

The 1976 data appear in the 1977 annual report.

TABLE 4.2
PRODUCTION AND AVERAGE WELLHEAD PRICE[1] OF NATURAL GAS, 1950-82

Year	Production[2] (million cubic feet)	Production[3] (million cubic feet)	Average Wellhead Price[3] (cents per thousand cubic feet)
1950	39,708	39,010	5.0
1951	39,038	36,123	5.3
1952	30,409	27,939	5.7
1953	31,779	28,592	6.3
1954	31,150	29,765	6.0
1955	30,468	30,227	5.2
1956	29,356	28,350	6.1
1957	32,979	31,413	6.0
1958	31,327	27,689	6.5
1959	31,585	30,551	6.0
1960	35,381	30,411	6.8
1961	34,884	32,407	6.4
1962	28,973	29,417	6.1
1963	27,113	25,504	6.6
1964	25,234	23,592	6.6
1965	27,873	26,285	6.5
1966	32,414	29,041	8.1
1967	31,619	29,276	7.9
1968	31,917	28,831	8.8
1969	41,229	37,804	7.2
1970	37,445	35,225	8.1
1971	38,137	28,775	8.2
1972	35,606	32,171	10.0
1973	58,896	56,383	15.9
1974	51,401	41,753	25.2
1975	44,546	41,664	39.4
1976	45,098	42,449	44.0
1977	48,181	45,245	72.0
1978	47,140	46,759	83.7
1979	53,888	54,969	120.2
1980	53,802	53,520	143.6
1981	50,073	48,654	190.0
1982	50,932	48,338	210.2

[1] Average wellhead price is computed by dividing the gross value of the gas produced by the volume produced.

NOTE: Oil and Gas Conservation Division production data are based on reports by gas producers, which exclude gas vented or flared and gas used in repressuring. Production equals the U.S. Department of the Interior, Bureau of Mines marketed production, except that some gas withdrawn from storage facilities in Montana may be included in the Oil and Gas Conservation Division data.

Department of Revenue data are based on tax receipts received from industry.

[2] SOURCE: Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, *Annual Review*, 1950-82.

[3] SOURCE: Montana Department of Revenue, Property Assessment Division (1950-81); Montana Department of Revenue, Research and Information Division (1982).

TABLE 4.3
SALES AND AVERAGE PRICES OF NATURAL GAS, 1950-82

	SALES (trillion BTU)					AVERAGE PRICE (cents per million BTU)				
Year	Residential	Commercial	Industrial	Other	TOTAL	Residential	Commercial	Industrial	Other	TOTAL
1950	12.3	5.9	12.9	1.7	**32.7**	36.9	27.0	30.3	5.9	**31.0**
1951	12.5	6.7	15.0	1.7	**35.9**	49.7	35.8	17.2	22.9	**32.3**
1952	12.3	7.1	15.4	2.9	**37.7**	51.6	37.0	21.4	20.5	**34.1**
1953	12.1	7.0	15.5	1.7	**36.3**	52.7	37.8	21.6	23.9	**35.2**
1954	13.4	7.7	14.1	1.7	**36.9**	52.6	38.7	22.3	24.2	**36.8**
1955	15.4	8.7	17.6	1.8	**43.5**	52.0	38.3	22.4	24.1	**36.1**
1956	15.8	9.0	18.8	1.8	**45.4**	51.0	37.7	21.8	24.2	**35.1**
1957	17.0	9.6	18.4	1.9	**46.9**	57.4	41.8	25.0	24.9	**40.2**
1958	16.3	9.1	19.3	1.9	**46.6**	59.1	43.1	27.0	27.0	**41.4**
1959	18.9	10.8	16.6	2.2	**48.5**	58.9	43.5	27.6	27.6	**43.3**
1960	18.5	11.0	19.8	2.0	**51.3**	60.1	45.2	27.6	29.2	**43.2**
1961	18.7	11.5	20.8	2.1	**53.1**	59.8	44.5	27.9	26.9	**42.7**
1962	19.4	12.0	21.9	2.2	**55.5**	65.7	47.1	29.8	30.1	**46.1**
1963	19.0	11.7	24.4	2.2	**57.3**	68.9	49.6	31.6	33.0	**47.6**
1964	21.1	13.2	26.6	2.4	**63.3**	68.2	49.2	31.6	32.8	**47.5**
1965	22.6	14.4	28.0	2.5	**67.4**	63.0	49.3	31.1	32.1	**47.4**
1966	22.0	14.2	28.2	2.5	**66.9**	69.4	50.2	31.6	33.1	**48.0**
1967	21.9	14.7	25.3	2.6	**64.4**	71.7	51.9	34.0	33.1	**50.9**
1968	22.4	14.6	26.6	2.7	**66.2**	75.4	55.7	33.0	32.9	**52.3**
1969	23.7	15.5	32.2	2.7	**74.1**	79.9	59.0	33.4	35.3	**53.7**
1970	23.5	15.4	36.4	3.5	**78.8**	84.2	62.1	33.6	36.1	**54.4**
1971	24.4	15.9	35.6	3.0	**79.0**	84.6	62.7	33.4	37.7	**55.3**
1972	25.9	16.9	36.7	3.3	**82.8**	87.1	64.5	34.4	39.4	**57.2**
1973	24.7	16.3	36.5	4.2	**81.7**	97.5	73.0	41.3	45.2	**64.7**
1974	23.8	15.7	36.1	3.1	**78.7**	102.0	88.0	57.0	58.0	**76.0**
1975	26.3	17.6	32.6	3.3	**79.8**	118.0	102.0	92.0	88.0	**103.0**
1976	23.9	16.0	28.3	2.9	**71.0**	150.0	130.0	124.0	123.0	**134.0**
1977	23.2	15.6	24.3	2.6	**65.8**	169.0	148.0	153.0	147.0	**157.0**
1978	24.4	16.5	21.4	2.7	**65.1**	205.0	178.0	169.0	175.0	**185.0**
1979	25.0	17.1	19.9	2.8	**64.8**	222.0	196.0	225.0	209.0	**215.0**
1980	20.5	14.4	16.6	2.7	**54.1**	288.0	293.0	317.0	380.0	**303.0**
1981	18.3	12.6	15.5	1.9	**48.2**	355.0	385.0	427.0	449.0	**390.0**
1982	21.2	14.6	11.6	2.1	**49.5**	422.0	460.0	549.0	492.0	**466.0**

NOTE: These data cover sales of natural gas by utilities only and do not include sales directly from producer to end-user. In the United States, direct sales make up a significant portion of total gas use, particularly in the industrial sector. In Montana, direct sales are not significant; hence, "total sales" is close to "total gas delivered." Some electric utility use of gas is included in the industrial sector.

Average heat content is highly variable, depending on elevation. Natural gas data converted to Btu, as in this table, are, therefore, only a rough approximation.

SOURCE: American Gas Association, *Gas Facts* (1950-82).

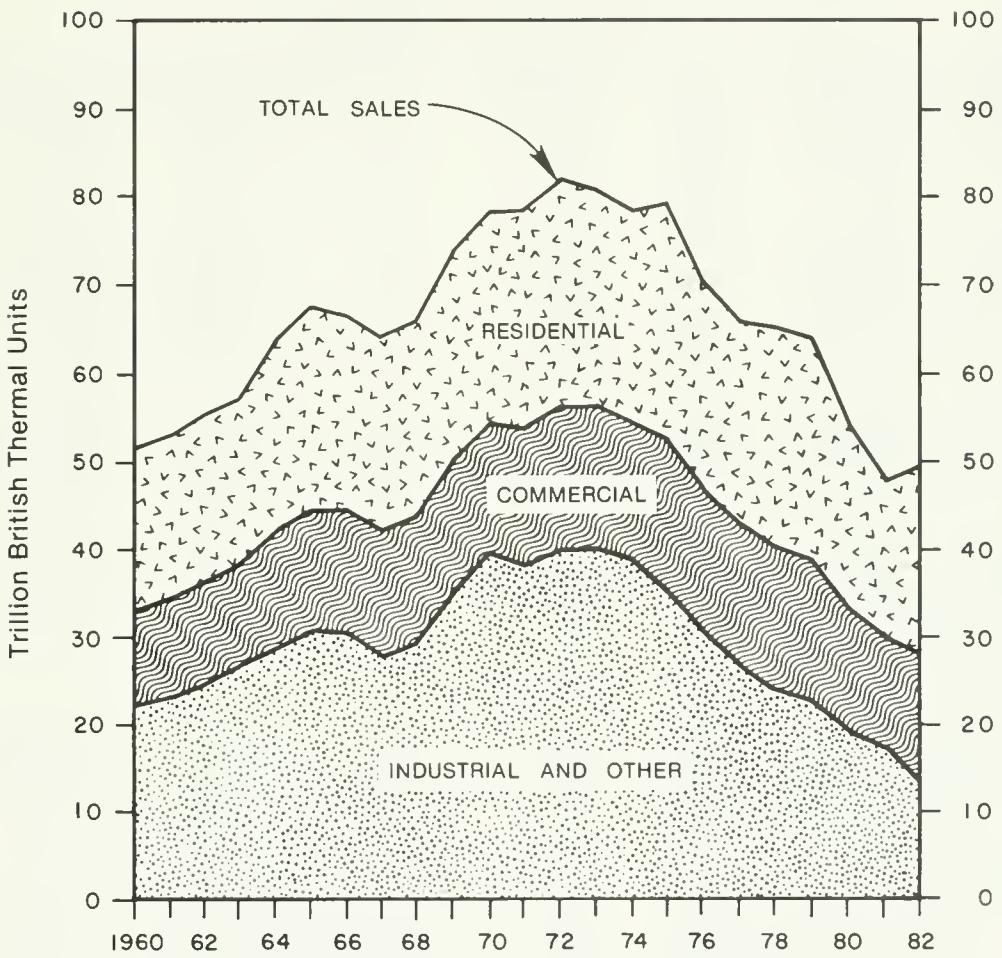

FIGURE 4.1 SALES OF NATURAL GAS BY CONSUMING SECTOR, 1960-82

SOURCE: Table 4.3.

TABLE 4.4
SALES[1] OF NATURAL GAS BY GAS UTILITIES, 1950-83
(million cubic feet)

	MONTANA POWER COMPANY[2]					MONTANA-DAKOTA UTILITIES[3]				
Year	Residential and Commercial	Industrial	Other	Total	% of Total Montana Sales	Residential and Commercial	Industrial	Other	Total	% of Total Montana Sales
1950	7,909	8,852	NA	16,761	54	4,228	240	469	4,937	16
1951	8,076	12,970	NA	21,046	59	5,514	1,180	499	7,193	20
1952	8,435	13,760	NA	22,195	62	7,340	1,845	468	9,653	27
1953	8,229	13,624	NA	21,853	62	7,223	1,863	480	9,566	27
1954	8,737	12,225	NA	20,962	59	7,912	1,649	495	10,056	28
1955	11,231	15,511	NA	26,742	64	7,594	1,996	533	10,123	24
1956	11,100	15,584	NA	26,684	63	7,708	2,212	509	10,429	25
1957	12,584	15,527	NA	28,111	64	7,797	2,056	492	10,345	24
1958	12,391	15,173	NA	27,564	63	7,429	3,233	551	11,213	26
1959	14,401	12,629	NA	27,030	60	8,678	2,934	507	12,119	27
1960	14,533	15,462	NA	29,995	62	8,516	3,148	342	12,006	25
1961	14,517	16,654	NA	31,171	63	8,689	3,606	177	12,472	25
1962	15,133	18,080	NA	33,213	64	9,148	3,051	103	12,302	24
1963	14,893	19,666	NA	34,559	65	8,826	3,862	79	12,767	24
1964	16,853	20,958	NA	37,811	64	9,620	4,687	55	14,362	24
1965	17,977	22,195	NA	40,172	64	10,955	4,430	61	15,446	24
1966	17,731	23,058	NA	40,789	65	10,414	4,256	55	14,725	24
1967	18,027	20,766	NA	38,793	64	10,584	3,813	67	14,464	24
1968	19,063	21,650	NA	40,713	65	10,847	4,523	65	15,435	24
1969	19,891	25,536	NA	45,427	64	11,534	6,277	55	17,866	25
1970	20,398	26,006	NA	46,404	63	11,499	8,582	102	20,183	27
1971	18,956	25,581	1,628	46,165	63	11,612	8,317	139	20,068	27
1972	20,068	26,128	1,491	47,687	62	12,352	8,218	600	21,170	28
1973	19,771	25,915	1,578	47,264	62	11,525	8,685	1,415	21,623	28
1974	18,931	26,301	1,408	46,640	63	11,230	8,455	588	20,273	28
1975	20,762	24,130	1,523	46,415	62	12,779	7,774	NA	20,553	28
1976	18,795	20,663	1,405	40,863	61	12,208	7,100	NA	19,307	29
1977	18,413	18,101	1,451	37,965	61	11,898	5,923	NA	17,821	29
1978	18,696	17,280	1,498	37,475	60	13,784	3,981	NA	17,765	29
1979	19,142	16,118	2,737	37,997	62	13,500	3,480	NA	16,981	28
1980	17,091	12,655	4,986	34,733	63	11,332	3,627	NA	14,959	27
1981	15,216	9,758	2,754	27,727	58	10,312	5,307	NA	15,618	32
1982	17,032	7,064	1,317	25,413	54	12,228	4,208	NA	16,436	35
1983	14,607	6,961	1,152	22,720		10,181	3,806	NA	13,987	

TABLE 4.4 (continued)

Year	GREAT FALLS GAS COMPANY[4] Residential and Commercial	Industrial	Other	Total	% of Total Montana Sales	OTHER UTILITIES[5] Total for all Sectors	% of Total Montana Sales	TOTAL SALES[6] Residential and Commercial	Industrial	Other	TOTAL
1950	2,509	208	53	2,770	9	6,481	21	21,127	9,300	522	**30,949**
1951	2,697	311	191	3,199	9	4,055	11	20,342	14,461	690	**35,493**
1952	2,566	228	333	3,127	9	852	2	19,193	15,833	801	**35,827**
1953	2,478	238	350	3,066	9	814	2	18,744	15,725	830	**35,299**
1954	2,795	255	400	3,450	10	892	2	20,336	14,129	895	**35,360**
1955	3,284	243	434	3,961	9	1,049	2	23,158	17,750	967	**41,875**
1956	3,361	204	396	3,961	9	1,019	2	23,188	18,000	905	**42,093**
1957	3,510	258	451	4,219	10	955	2	24,846	17,841	943	**43,630**
1958	3,365	268	475	4,108	9	1,067	2	24,252	18,674	1,026	**43,952**
1959	4,048	388	566	5,002	11	1,175	2	28,302	15,951	1,073	**45,326**
1960	3,928	512	516	4,956	10	1,152	2	28,129	19,122	858	**48,109**
1961	4,067	380	606	5,053	10	1,045	2	28,318	20,640	783	**49,741**
1962	4,092	371	752	5,215	10	1,078	2	29,451	21,502	855	**51,808**
1963	4,030	396	793	5,219	10	945	2	28,694	23,924	872	**53,490**
1964	4,446	480	847	5,773	10	1,018	2	31,937	26,125	902	**58,964**
1965	4,767	499	868	6,134	10	1,160	2	34,859	27,124	929	**62,912**
1966	4,593	490	846	5,929	9	1,125	2	33,863	27,804	901	**62,568**
1967	4,505	397	856	5,758	10	1,160	2	34,276	24,976	923	**60,175**
1968	4,504	424	852	5,780	9	1,074	2	35,488	26,597	917	**63,002**
1969	5,042	412	891	6,345	9	1,118	2	37,585	32,225	946	**70,756**
1970	4,926	378	902	6,206	8	1,010	1	37,833	34,966	1,004	**73,803**
1971	4,901	367	895	6,163	8	1,048	1	36,517	34,265	2,662	**73,444**
1972	5,185	353	884	6,422	8	1,105	1	38,710	34,699	2,975	**76,384**
1973	4,729	414	864	6,007	8	982	1	37,007	35,014	3,857	**75,876**
1974	4,504	412	807	5,723	8	936	1	35,601	35,168	2,803	**73,572**
1975	5,145	354	845	6,344	8	1,000	1	39,686	32,258	2,368	**74,312**
1976	4,875	237	892	6,004	9	762	1	36,640	28,000	2,297	**66,936**
1977	4,317	246	734	5,297	8	715	1	35,343	24,270	2,185	**61,798**
1978	4,818	196	826	5,840	9	824	1	38,122	21,457	2,324	**61,904**
1979	4,512	249	750	5,512	9	804	1	37,958	19,847	3,487	**61,294**
1980	3,888	266	689	4,842	9	669	1	32,980	16,548	5,675	**55,203**
1981	3,257	169	619	4,044	8	573	1	29,358	15,234	3,373	**47,962**
1982	3,289E	188E	627E	4,104E	9	596	1	33,145E	11,460 E	1,944E	**46,549E**
1983	3,320	206	636	4,162							

NA Not available.

E Estimate.

TABLE 4.4 (continued)

[1] Sales to other utilities for resale and sales of natural gas to Canada are not included.

[2] From 1950 to 1970, government and municipal sales were reported in the "Residential and Commercial" sector.

"Other" includes interdepartmental use, sales to government and municipal authorities for heating, and special off-line sales to firms in Montana where these figures are reported separately.

[3] "Other" includes interdepartmental use and natural gas used in MDU's electric generating plants at Baker, Glendive, and Miles City. Company consumption and unbilled customer consumption as part of a lease agreement at Saco are not included.

The 1975-83 data uses slightly different sector definitions; as a result, consumption in the "Other" sector is not shown separately for these years.

[4] "Other" includes sales to Malmstrom Air Force Base and other public authorities.

[5] "Other Utilities" includes the following companies (listed in approximate descending order by volume of sales):

Cut Bank Gas Company:	Supplies natural gas to Cut Bank; approximately 80 percent of its gas is purchased from the Montana Power Company.
Shelby Gas Association:	Supplies natural gas to Shelby; gas is purchased from the Montana Power Company.
Consumers Gas Company:	Supplies natural gas to Ferdig, Oilmont, Sunburst and Sweetgrass; gas is purchased from the Montana Power Company and the Hardrock Oil Company through the Treasure State Pipeline Company.
Saco Municipal Gas Service:	Supplies natural gas to Saco from the town's own wells.

Some of the smaller natural gas utilities have experienced problems measuring actual sales volumes. Therefore, the figures for these utilities should be considered estimates.

[6] All gas sales from "Other Utilities" are included under "Residential and Commercial."

The definition of "Other" varies from utility to utility and from year to year, as indicated.

NOTE: Source documents from the Public Service Commission often report data at sales pressure rather than at a uniform pressure base. When necessary, the data were converted to the uniform pressure base of 14.73 psia at 60 degrees Fahrenheit using Boyle's law.

The source reports are for the companies' fiscal years ending during the year shown. Because reporting years vary from utility to utility, the data represent various twelve-month periods and are, in that sense, not strictly comparable.

The Saco Municipal Gas Service and the Cut Bank Gas Company have reporting years ending June 30. The Shelby Gas Association's reporting year ends November 30. The Consumer Gas Company, the Montana Power Company, and Montana-Dakota Utilities use calendar year reporting periods.

The Great Falls Gas Company used a calendar year reporting period through 1981; they filed a six-month report for the period January 1, 1982, through June 30, 1982, and then changed to a twelve-month reporting period ending June 30.

Through 1981, Great Falls Gas Company figures are based on reports for the twelve months ending December 31 of that year. The 1982 figures were estimated by the sector averages from the 1981 and 1983 twelve-month reports. The 1983 figures and those for all subsequent years are based on twelve-month reports ending June 30 of that year.

SOURCE: Annual reports filed with the Montana Public Service Commission by the natural gas utilities (1950-83), supplemented by information obtained directly from the utilities.

TABLE 4.5
NATURAL GAS PRODUCTION AND CONSUMPTION, 1950-82
(million cubic feet)

Year	Gross Withdrawal[1]	Marketed Production[2]	Consumption[3]	GAS DELIVERED					
				Residential	Commercial	Industrial[4]	Electric Utilities	Other Consumers[5]	TOTAL
1950	40,975	38,972	38,333	12,596	7,536	13,979	892	NA	35,002
1951	36,897	36,225	37,276	12,287	7,379	15,047	884	NA	35,598
1952	29,140	28,557	41,545	12,263	7,794	17,422	998	NA	38,476
1953	28,245	27,736	40,953	12,029	7,544	16,559	1,237	NA	37,368
1954	30,532	30,087	41,002	13,314	8,277	14,909	601	NA	37,101
1955	28,841	28,100	47,861	15,335	9,427	18,240	630	NA	43,631
1956	26,852	25,706	48,305	15,235	9,314	18,226	876	NA	43,651
1957	30,830	28,481	54,868	16,725	10,116	18,429	2,954	NA	48,224
1958	30,830	27,836	54,725	14,970	9,546	18,960	3,183	NA	46,659
1959	32,819	30,575	51,898	17,310	11,124	16,438	1,005	NA	45,877
1960	37,792	33,235	54,271	16,825	11,820	19,558	339	NA	48,543
1961	36,798	33,716	57,465	17,086	12,140	21,404	354	NA	50,985
1962	32,621	29,791	62,952	17,078	12,302	21,713	3,692	NA	54,785
1963	31,228	29,862	66,969	17,274	12,569	24,613	3,285	NA	57,740
1964	26,653	25,050	67,282	18,792	13,059	26,419	2,437	NA	60,706
1965	29,800	28,105	70,895	19,908	14,110	28,310	1,992	NA	64,320
1966	36,048	30,685	73,829	19,690	14,068	29,571	2,977	NA	66,306
1967	31,610	25,866	65,782	19,756	13,090	22,584	502	2,426	58,358
1968	32,229	19,313	63,642	19,711	11,529	23,155	631	2,122	57,148
1969	68,064	41,229	78,988	21,463	14,239	31,917	1,520	2,354	71,493
1970	48,302	42,705	90,823	24,794	15,520	36,105	2,529	3,044	81,992
1971	38,136	32,720	89,021	25,379	15,734	36,800	1,075	2,375	81,363
1972	38,137	33,474	85,161	23,787	16,521	33,192	1,218	2,630	77,348
1973	60,931	56,175	91,148	24,923	16,786	37,898	2,322	2,357	84,286
1974	59,524	54,873	80,766	21,590	14,353	35,202	1,111	2,249	74,505
1975	44,547	40,734	80,351	24,097	16,233	31,631	1,059	2,421	75,441
1976	45,097	42,563	78,094	23,525	15,490	31,049	709	2,341	73,114
1977	48,181	46,819	70,956	21,596	14,626	27,260	953	2,080	66,515
1978	48,497	46,522	72,649	22,944	15,548	26,686	909	2,218	68,305
1979	56,094	53,888	69,805	22,579	15,255	20,411	2,320	2,141	62,706
1980	53,802	51,867	60,724	19,296	13,612	16,717	4,182	653	54,460
1981	58,502	56,565	52,452	17,245	12,572	15,494	2,069	1,153	48,533
1982	58,184	56,517	52,208	19,989	15,987	11,574	337		47,887

[1] Gross Withdrawal is defined as marketed production, plus quantities used in repressuring, plus quantities vented and flared from both gas wells and oil wells.

[2] Marketed Production represents gross withdrawals of natural gas from gas and oil wells, less gas used for repressuring, nonhydrocarbon gases removed, and quantities vented and flared.

For 1979 and prior years, the volumes of nonhydrocarbon gases included in marketed production were not reported. For 1980 and 1981, the amount of nonhydrocarbon gases removed was not available for the Montana data, so DOE used the same figure for Montana's marketed production *including* nonhydrocarbon gases as is used for marketed production *excluding* nonhydrocarbon gases.

[3] Consumption is defined as total gas delivered to consumers, plus lease and plant fuel, plus pipeline fuel.

[4] Industrial use includes refinery use of gas, but excludes pipeline fuel.

[5] Other Consumers includes delivery to municipalities and public authorities for institutional heating, street lighting, etc. This category was not used before 1967; it was included in Industrial Consumption before that year. This category was merged with the Commercial category in 1982.

SOURCES: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, *Natural Gas Production and Consumption*, annual reports for 1950-75; U.S. Department of Energy, Energy Information Administration, *Natural Gas Production and Consumption*, annual reports for 1976-79 (EIA-0131); U.S. Department of Energy, Energy Information Administration, *Natural Gas Annual*, annual reports for 1980-82 (EIA-0131).

TABLE 4.6
AVERAGE ANNUAL NATURAL GAS PRICES,[1] 1950-82
(cents per thousand cubic feet)

Year	Wellhead[2]	Retail[3]	DELIVERED			
			Residential	Commercial	Industrial	All Consumers
1950	5.3	28.7	47.3	32.8	14.2	30.1
1951	5.5	31.3	51.0	35.1	16.0	32.0
1952	6.1	31.8	50.7	35.2	19.2	32.4
1953	5.9	32.9	53.1	36.8	19.4	33.7
1954	6.8	37.5	58.9	41.5	20.1	38.8
1955	6.7	36.7	58.3	41.1	20.2	38.0
1956	6.8	36.8	58.5	41.2	20.6	38.2
1957	7.2	36.9	58.3	41.3	20.8	38.0
1958	6.8	38.4	64.7	44.3	21.8	40.1
1959	7.5	41.6	64.7	45.7	26.7	45.6
1960	7.1	41.6	66.0	46.4	27.4	45.4
1961	7.4	40.3	65.5	45.9	25.7	43.8
1962	7.4	41.9	75.2	50.6	25.1	46.4
1963	7.5	41.3	74.6	50.7	26.8	46.2
1964	7.8	45.7	76.3	53.3	30.3	49.5
1965	8.2	46.8	78.1	54.1	31.1	50.6
1966	8.3	45.8	77.9	54.3	30.4	49.5
1967	8.4	49.9	79.6	57.1	34.1	54.6
1968	9.1	50.9	82.2	60.3	32.6	55.4
1969	10.2	52.2	88.2	64.3	33.8	56.2
1970	10.3	52.9	90.7	65.9	33.9	57.2
1971	12.1	56.3	93.4	68.5	35.7	60.3
1972	12.3	58.7	96.5	69.1	38.1	63.0
1973	23.6	66.1	108.6	80.4	42.5	69.8
1974	25.3	75.8	111.9	92.6	58.0	80.4
1975	43.3	104.6	129.6	110.1	94.9	108.9
1976	44.5	111.7	136.4	118.7	93.0	116.4
1977	71.9	157.6	181.6	158.4	155.8	164.1
1978	84.7	166.1	189.4	164.6	164.2	172.0
1979	121.1	188.9	221.3	200.2	174.9	200.4
1980	145.4	296.7	305.3	311.7	314.3	318.2
1981	190.9	386.9	375.4	413.8	425.8	405.7
1982	214.5	464.1	446.0	487.4	548.8	482.9

[1] Average prices were computed by dividing the annual value of natural gas by the annual volume of natural gas.

[2] Average wellhead prices were computed using the marketed production figure for natural gas.

In 1980 Montana reported the value associated with gross withdrawals to DOE and, thus, the average value of the gross withdrawal volume was used as the average wellhead value. This is probably the case in other years as well.

[3] Average retail prices were computed using the consumption figure for natural gas.

NOTE: Other Consumers were included in the Industrial category prior to 1967. From 1967 to 1981, Other Consumers were not reported separately, but were included in the overall average figure shown in the All Consumers category. Other Consumers are included in the Commercial category beginning in 1982.

Data from electric utilities are not shown separately but are included in the All Consumers category.

SOURCES: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, *Natural Gas Production and Consumption,* annual reports for 1950-75; U.S. Department of Energy, Energy Information Administration, *Natural Gas Production and Consumption,* annual reports for 1976-79 (EIA-0131); U.S. Department of Energy, Energy Information Administration, *Natural Gas Annual,* annual reports for 1980-82 (EIA-0131).

TABLE 4.7
CAPACITY AND PRODUCTION OF NATURAL GAS PROCESSING PLANTS, 1961-82

As of Dec. 31 of the Year	Number of Plants	INPUT (million cubic feet per day)		AVERAGE PRODUCTION (gallons per day)						
		Gas Capacity	Gas Through-put	Propane	Normal or Unsplit Butane	Liquefied Petroleum Gas Mix	Raw Natural Gas Liquid Mix	Debutanized Natural Gasoline	Other	TOTAL PRODUCTS
1961	2	66.2	32.0	8,000	8,600	—	39,400	—	—	56,000
1962	2	65.8	27.4	9,400	8,000	—	37,000	—	—	54,400
1963	2	65.8	21.9	6,100	6,400	—	32,200	—	—	44,700
1964	2	55.8	23.3	6,800	7,600	—	38,700	—	—	53,100
1965	2	55.8	24.3	3,700	8,900	—	38,400	—	—	51,000
1966	5	66.8	32.9	30,800	9,200	6,000	77,240	—	—	123,240
1967	5	360.9	272.9	23,325	9,000	25,370	47,155	—	—	104,850
1968	5	107.8	82.5	32,500	9,000	15,000	54,900	—	—	111,400
1969	4	68.8	57.0	37,500	9,000	15,000	75,000	—	—	136,500
1970	7	75.8	42.7	40,800	11,000	—	60,500	35,680	—	147,980
1971	6	73.3	40.3	33,550	9,400	6,000	59,400	9,590	—	117,940
1972	4	44.3	29.6	24,900	9,400	—	43,500	9,500	—	87,390
1973	4	44.3	21.3	28,727	6,026	17,000	13,576	—	—	65,329
1974	4	45.3	20.6	30,786	8,260	—	9,000	10,466	17,000	75,512
1975	4	44.3	26.1	31,200	9,100	—	9,000	8,350	16,000	73,650
1976	8	56.3	28.5	30,300	9,600	24,000	16,000	22,600	—	102,500
1977	6	53.5	30.6	20,800	12,200	17,000	16,600	10,500	—	77,100
1978	7	54.5	26.1	21,700	12,900	11,000	16,500	10,000	—	72,100
1979	8	62.9	28.3	26,800	11,200	—	43,700	—	—	81,700
1980	8	60.9	36.3	32,300	10,600	—	54,800	—	400	98,100
1981	9	58.8	35.5	27,800	7,900	10,000	50,500	—	800	97,000
1982	9	63.3	37.8	30,600	12,100	5,000	43,200	8,400	1,000	100,300

NOTE: Since this compilation includes cycling plants reprocessing pipeline gas, totals shown here for gas throughput do not relate directly to government data on total gas processed or sold. Similarly, liquids production figures are based on yearly average and do not necessarily reconcile with government data.

SOURCE: *Oil and Gas Journal*, annual gas processing report issue (1961-82).

TABLE 4.8
INDUSTRIAL CONSUMPTION OF NATURAL GAS BY STANDARD INDUSTRIAL CLASSIFICATION CODE, 1977-81
(million cubic feet)

STANDARD INDUSTRIAL CLASSIFICATION		CONSUMPTION				
Group	Description	1977	1978	1979	1980	1981
10-14	Mining	711	699	368	366	430
20	Food and Kindred Products	2,255	1,384	1,806	1,743	1,784
24	Lumber and Wood Products	1,311	867	758	521	214
26	Paper and Allied Products	3,601	3,854	3,782	3,766	3,482
27	Printing and Publishing	188				
28	Chemicals and Allied Products	1,377	1,027	903	1,185	962
29	Petroleum and Coal Products	5,045	3,366	2,673	2,591	4,353
32	Stone, Clay, Glass, and Concrete Products	2,248	2,276	1,303	431	296
333-339	Primary Nonferrous Metals	8,069	6,853	7,311	4,978	3,102
37	Transportation Equipment	314	339	364	302	
40-49	Transportation and Public Utilities					1,607
Other SIC Classes and Not Classified or Unreported		688	991	821	1,466	1,224
	TOTAL INDUSTRIAL CONSUMPTION	**25,807**	**21,656**	**20,089**	**17,349**	**17,454**

SOURCES: Gas Requirements Agency, University of Denver Research Institute, *United States Gas Consumption 1977,* September 1978; Gas Requirements Agency, Mellon Institute of Research, *Future Gas Consumption in the United States (1978),* volume 8, December 1979; Gas Requirements Agency, Mellon Institute of Research, *Actual Gas Consumption in the United States 1979,* September 1980 (supplement to volume 8 of *Future Gas Consumption in the United States);* Gas Requirements Committee, *Future Gas Consumption in the United States,* volume 9, August 1982; Gas Requirements Committee, *Actual Gas Consumption in the United States 1981,* November 1982 (supplement to volume 9 of *Future Gas Consumption in the United States).*

TABLE 4.9
PRODUCING GAS AND GAS CONDENSATE WELLS, 1966-82

Year	Number of Wells
1966	784
1967	648
1968	1,196
1969	1,098
1970	739
1971	1,056
1972	1,116
1973	1,118
1974	1,450
1975	1,235
1976	1,490
1977	1,438
1978	1,755
1979	1,881
1980	1,881
1981	2,140
1982	2,111

SOURCES: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, *Natural Gas Production and Consumption*, annual reports (1966-75); U.S. Department of Energy, Energy Information Administration, *Natural Gas Production and Consumption*, annual reports for 1976-79 (EIA-0131); U.S. Department of Energy, Energy Information Administration, *Natural Gas Annual*, annual reports for 1980-82 (EIA-0131).

TABLE 4.10
AVERAGE NATURAL GAS CONSUMPTION AND ANNUAL COST PER CONSUMER, 1980-82

Year	Sector	Consumption (thousand cubic feet)	Cost (dollars)
1980	Residential	117	356
	Commercial	670	2,089
	Industrial	32,841	103,218
1981	Residential	104	389
	Commercial	610	2,523
	Industrial	31,364	133,551
1982	Residential	121	538
	Commercial	780	3,800
	Industrial	24,013	131,770

SOURCE: U.S. Department of Energy, Energy Information Administration, *Natural Gas Annual*, annual reports for 1980-82 (EIA-0131).

5

CRUDE OIL AND PETROLEUM PRODUCTS

HIGHLIGHTS

- Montana's proved reserve of crude oil was estimated by the U.S. Department of Energy to be 216 million barrels as of December 31, 1982. This is 30 million barrels more than the 1981 reserve estimate. The Oil and Gas Conservation Division of the Montana Department of Natural Resources and Conservation estimated the reserves at 228 million barrels, nearly three-fourths of which were located in the Williston Basin. The Williston Basin reserve estimates were up 19 percent over the previous year.
- Thirty-one million barrels of crude oil were extracted in 1982. This is approximately the same amount as in the previous year.
- The average wellhead price of oil was $31.26 per barrel in 1982, down 10 percent from the previous year.
- Montana refineries processed 42 million barrels of crude oil in 1982, up 9 percent from the previous year.
- With the advent of commercial marketing of Montana-produced gasohol in 1981, gasohol consumption in Montana jumped from under one-half million gallons in 1981 to over 10 million gallons in 1982.

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TABLE 5.1
YEAR-END PROVED RESERVES[1] OF CRUDE OIL, 1950-82
(thousand barrels)

Year	United States[2]	Montana[2]	United States[3]	Montana[3]
1950	25,268,398	111,272		
1951	27,468,031	108,418		
1952	27,960,554	156,181		
1953	28,944,828	208,985		
1954	29,560,746	272,394		
1955	30,012,170	298,948		
1956	30,434,649	331,414		
1957	30,300,405	319,991		
1958	30,535,917	337,799		
1959	31,719,347	309,268		
1960	31,613,211	266,687		
1961	31,758,505	250,909		
1962	31,389,223	248,860		
1963	30,969,990	271,253		
1964	30,990,510	251,620		
1965	31,352,391	274,145		
1966	31,452,127	281,608		
1967	31,376,670	307,972		
1968	30,707,117	345,117		
1969	29,631,862	275,765		
1970	39,001,335	241,529		
1971	38,062,957	228,185		
1972	36,339,408	241,248		
1973	35,299,839	219,343		
1974	34,249,956	207,389		
1975	32,682,127	163,968		
1976	30,942,166	152,670	33,502,000	181,000
1977	29,486,402	151,601	31,780,000	175,000
1978	27,803,760	140,466	31,355,000	158,000
1979	27,051,289	136,590	29,810,000	152,000
1980			29,805,000	179,000
1981			29,426,000	186,000
1982			27,858,000	216,000

[1] Proved reserves are the estimated amount of oil that geologic and engineering data indicate is recoverable from known reservoirs under present economic and operating conditions.

NOTE: The American Gas Association (AGA) ceased making independent crude oil reserve estimates in 1979. Beginning in 1980, the AGA reported the reserve estimates calculated by DOE. Both DOE and AGA figures for 1976-79 are shown for comparison purposes.

[2]SOURCES: American Petroleum Institute (1950-76); American Gas Association, *Gas Facts*, 1977-79.

[3]SOURCES: U.S. Department of Energy, Energy Information Administration, *U.S. Crude Oil and Natural Gas Reserves*, annual reports for 1977-78 (EIA-0216); U.S. Department of Energy, Energy Information Administration, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, annual reports for 1979-82 (EIA-0216).

TABLE 5.2
ESTIMATES OF CRUDE OIL PROVED RESERVES BY REGION, 1955-83
(thousand barrels)

As of January 1 of the year	REGION[1] North	South Central	Central	Southeast	Northeast	Miscellaneous	TOTAL[2]
1955							289,742
1956							333,782
1957							343,411
1958							321,566
1959							325,484
1960							297,993E
1961							254,946
1962							334,074
1963							341,225
1964							371,929E
1965	147,007	69,895	29,637		161,504		408,043
1966	144,281	61,516	38,668		163,101		407,566
1967	137,638	56,828	39,424		159,470		393,360
1968	128,131	53,366	37,820	64,417	168,760		452,494
1969	121,999	35,913	29,906	97,497	166,742		452,057
1970	115,782	33,995	27,085	84,534	168,385		429,781
1971	121,160	29,703	26,698	77,045	170,508		425,114
1972	114,369	29,036	28,518	71,183	171,235		414,341
1973	102,484	18,917	25,704	64,751	154,271		366,127
1974	91,421	14,394	29,651	56,670	141,864		334,000
1975	76,739	10,996	26,688	47,336	148,241		310,000
1976	47,619	10,336	32,957	38,629	125,459		255,000
1977	43,119	9,581	31,647	29,922	118,726		232,500
1978	41,133	9,916	30,671	38,272	113,011		233,000
1979	40,884	13,054	27,895	26,055	130,037	2,080	240,005
1980	38,079	12,225	25,133	24,261	132,216	4,086	236,000
1981	39,174	13,029	21,855	17,669	153,604	2,669	248,000
1982	25,678	5,204	17,051	15,519	139,618	10	203,080
1983	27,443	4,378	11,307	13,251	166,341	32	228,560

E Two of the source publications were biennial rather than annual, and in each of these publications there was only one estimate of the crude oil reserves. Crude oil reserves for the two "missing" years have been interpolated from data values in the adjacent years.

[1] The regions shown correspond to the following geological basins:

North	Sweetgrass Arch and Bearpaw Uplift
Northeast	Williston Basin
Central	Big Snowy Uplift
South Central	Big Horn Basin
Southeast	Powder River Basin

[2] The Oil and Gas Division acknowledges discrepancies between the sum of the regional reserve estimates (where the region estimates are aggregates of individual field reserve estimates) and the reported statewide reserve estimate. However, these differences are only a very small proportion of the statewide estimate. For example, for January 1, 1983, the regional reserve estimates sum to 222,752,000 barrels, while the statewide estimate was 228,560,000 barrels. The difference, 5,808,000 barrels, is 2.5 percent of the statewide estimate.

SOURCE: Montana Department of Natural Resources and Conservation, Oil and Gas Division, *Annual Review*, 1955-82.

TABLE 5.3
CRUDE OIL PRODUCTION AND AVERAGE WELLHEAD PRICES,[1] 1950-82

Year	Production of Crude Oil[2] (thousand barrels)	Wellhead Price[2] (dollars per barrel)	Production of Crude Oil[3] (thousand barrels)	Wellhead Price[3] (dollars per barrel)	Production of Crude Oil[4] (thousand barrels)	Wellhead Price[4] (dollars per barrel)
1950	8,109			2.52	7,841	2.47
1951	8,958			2.47	8,814	2.35
1952	9,606			2.25	9,527	2.26
1953	11,920			2.18	11,793	2.23
1954	14,195			2.20	14,023	2.22
1955	15,654			2.26	16,548	2.18
1956	21,760			2.58	21,262	2.47
1957	27,122			2.70	26,658	2.43
1958	27,957			2.65	27,816	2.62
1959	29,857			2.56	29,985	2.50
1960	30,240			2.41	29,937	2.45
1961	30,906			2.42	30,499	2.42
1962	31,648			2.42	31,270	2.44
1963	30,870			2.44	30,364	2.44
1964	30,647			2.43	30,241	2.45
1965	32,778			2.43	32,089	2.44
1966	35,380			2.44	34,734	2.45
1967	34,959			2.50	34,316	2.50
1968	48,460			2.57	47,152	2.56
1969	43,954			2.69	44,446	2.76
1970	37,879			2.78	38,058	2.83
1971	34,599			3.01	34,625	3.05
1972	33,904		33,904	3.07	34,572	2.99
1973	34,620		34,620	3.33	34,584	3.85
1974	34,554		34,554	6.65	34,629	6.82
1975	32,844		32,844	7.83	32,815	7.83
1976	32,814		32,814	8.42	32,057	8.49
1977	32,680		32,680	8.58	30,696	9.07
1978	30,467		30,467	9.25	30,935	9.31
1979	29,957	12.39	29,957	12.39	30,286	13.00
1980	29,584	22.24	29,584	22.24	29,927	20.92
1981	30,813	34.73	30,813	34.69	30,518	34.48
1982	30,917	31.26	30,921	31.24	30,938	31.14

[1] Average wellhead prices were computed by dividing the gross value of production by the number of barrels extracted.

SOURCES: [2] Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, *Annual Review*, 1950-82.

The Oil and Gas Conservation Division acknowledges discrepancies in its data. For 1982, the difference between the amount of Montana oil available for refining in Montana (calculated as the amount of oil produced in Montana less the amount of Montana oil exported) and the amount of Montana oil delivered to refineries in Montana was 132,000 barrels. Of this, 69,000 barrels were presumed used or lost by producers and 30,000 barrels were presumed to be in tank storage at the oil fields. The remaining 33,000 barrels are unaccounted for, but constitute only one-tenth of 1 percent of the 1982 Montana production.

[3] U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, *Crude Petroleum, Petroleum Products, and Natural Gas Liquids*, annual reports for 1950-75; U.S. Department of Energy, Energy Information Administration, *Crude Petroleum, Petroleum Products, and Natural Gas Liquids*, annual reports for 1976-80 (EIA-0108); U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, annual reports for 1981-82 (EIA-0340) for 1981 and 1982 production figures; U.S. Department of Energy, Energy Information Administration (phone call) for 1981 and 1982 wellhead prices.

DOE used the reported state figures for the years 1972-80 in its publications. In 1982 DOE went to independent estimates for its data. These independent estimates, which may appear in future DOE publications, are as follows: 1979—31,224 thousand barrels and $12.03 per barrel; 1980—30,193 thousand barrels and $20.53 per barrel; 1981—31,040 thousand barrels.

[4] Montana Department of Revenue, Property Assessment Division (1950-81); Montana Department of Revenue, Research and Information Division (1982).

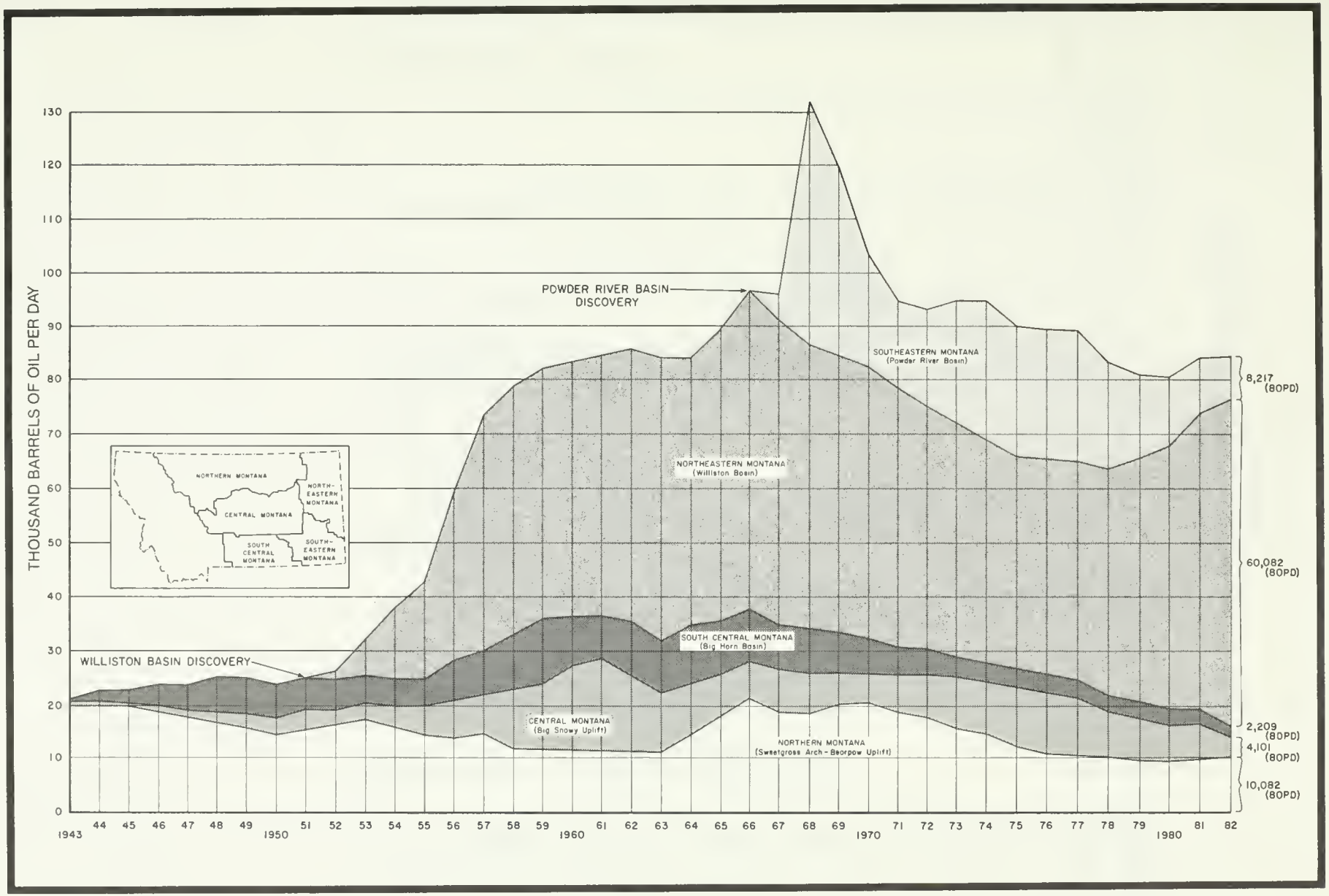


FIGURE 5.1 CRUDE OIL PRODUCTION, 1943-82

SOURCE: Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, *Annual Review*, 1982.

TABLE 5.4
REFINERY RECEIPTS BY SOURCE OF CRUDE OIL, 1953-82
(thousand barrels)

	CONTINENTAL OIL (Billings)				EXXON[1] (Billings)				FARMERS UNION (Laurel)				
Year	Montana	Wyoming	Canada	Total[2]	Montana	Wyoming	Canada	Total	Montana	Wyoming	North Dakota	Canada	Total
1953	337	2,753		3,089	1,067	6,277		7,344	949	3,083			4,032
1954	623	2,277		2,909	1,641	5,355		6,995	1,618	3,234			4,853
1955	1,268	2,077		3,358	1,778	5,225		7,004	1,446	3,908			5,354
1956	560	2,671		3,231	1,352	7,095		8,447	1,916	3,936			5,852
1957	681	2,795		3,475	1,777	6,602		8,378	1,830	4,249			6,078
1958	807	2,313		3,120	2,316	4,445		6,792	1,395	3,113			4,509
1959	971	2,793		3,765	4,414	6,760		11,173	1,215	5,589			6,804
1960	728	3,422		4,151	3,634	6,175		9,808	2,008	4,786			6,794
1961	729	3,955		4,685	3,583	5,991		9,574	1,859	4,092			5,951
1962	1,954	3,434	185	5,573	2,519	9,496	12	12,028	2,754	3,740			6,495
1963	2,418	2,241	1,046	5,705	2,200	8,739	495	11,435	2,974	3,425			6,699
1964	3,732	1,548	3,692	8,973	2,275	9,530	288	12,093	2,723	4,603			7,326
1965	2,697	3,068	4,593	10,359	2,293	9,659	37	11,989	2,635	3,665			6,300
1966	1,773	4,148	4,674	10,595	2,318	9,557		11,875	2,079	4,415			6,494
1967	1,813	3,936	5,052	10,802	2,073	11,851		13,924	1,833	5,606			7,439
1968	1,714	1,995r	10,125r	13,834	1,451	12,387	222	14,060	1,264	6,533			7,797
1969	1,637	3,443r	8,482r	13,562	1,240	11,964	360	13,564	1,539	6,723			8,261
1970	1,351	3,345r	9,123r	13,820	1,090	11,062	2,381	14,532	1,355	4,935		2,404	8,695
1971	1,170	3,592r	10,070r	14,833	1,046	10,997	2,564	14,607	1,526	5,143		3,369	10,038
1972	1,119	3,796r	12,240r	17,154	849	10,821	3,706	15,376	1,703	4,625		4,229	10,556
1973	1,046	3,272r	12,170r	16,488	1,089	10,011	5,568	16,668	1,672	4,952		5,299	11,922
1974	1,340	4,299r	11,113r	16,752	744	8,753	4,870	14,367	1,599	3,897		5,697	11,192
1975	1,703	5,478r	9,291r	16,472	879	8,615	5,606	15,100	1,466	5,373		4,339	11,178
1976	1,846	4,495	11,125	17,466	1,005	7,719	5,818	14,542	1,200	6,097		5,354	12,651
1977	3,153	3,558	10,064	16,776	521	8,211	5,234	13,967	903	6,478	193	5,105	12,679
1978	2,970	3,404	9,057	15,431	519	9,432	4,413	14,364	1,019	4,677	64	7,351	13,111
1979	2,937	3,943	10,385	17,266	573	9,911	5,422	15,906	810	4,513		6,932	12,254
1980	2,488	3,750	9,878	16,134	641	10,304	3,789	14,734	852	4,996	8	3,669	9,525
1981	2,860	3,183	7,026	13,083	516	10,260	2,182	12,958	702	4,855		2,430	7,987
1982	2,496r	4,009r	8,525	15,030	304	10,555	1,438	12,296	1,290	3,615		5,269	10,174

TABLE 5.4 (continued)

Year	BIG WEST OIL (Kevin)			SIMMONS[3] (Great Falls)			TESORO[4] (Wolf Point)			WESTCO[5] (Cut Bank)		
	Montana	Canada	Total	Montana	Canada	Total	Montana	Canada	Total[6]	Montana	Canada	Total
1953	686		686	857		857				1,305		1,305
1954	652		652	839		839				1,252		1,252
1955	705		705	874		874				1,279		1,279
1956	729		729	997	7	1,004	86		86	1,257	47	1,304
1957	742		742	831	16	847	98		98	1,258	54	1,312
1958	751		751	995		995	45		45	1,203	12	1,215
1959	805		805	1,226		1,226	55		55	1,175	4	1,180
1960	775		775	1,298		1,298	17		17	1,142	21	1,162
1961	831		831	1,318		1,318				1,099	14	1,114
1962	852	3	855	1,436		1,436				1,050	41	1,091
1963	916		916	1,616		1,616				1,130	11	1,141
1964	920		920	1,491		1,491	78		78	880	21	901
1965	1,034		1,034	1,500		1,500	508		508	1,134	24	1,158
1966	765		765	1,619		1,619	681		681	1,159	9	1,169
1967	967		967	1,770		1,770	747		747	1,191		1,191
1968	1,290		1,290	1,690		1,690	820		820	1,258		1,258
1969	1,101		1,101	1,609		1,609	861		861	1,274		1,274
1970	1,207		1,207	1,691		1,691	806		806	1,388		1,388
1971	1,136		1,136	1,955		1,955	843		843	1,371		1,371
1972	523r	705r	1,228r	2,120		2,120	765		765	954r	276r	1,230r
1973	675r	784r	1,469	2,220		2,220	668		668	1,057r	464r	1,513r
1974	519r	940r	1,459	2,056	81	2,136	590	23	613	1,142r	392r	1,534r
1975	398r	820r	1,218r	1,724	433	2,158	687	4	690	1,145r	166r	1,311r
1976	565	658	1,223	1,537	539	2,076	959		959	1,406		1,406
1977	110	200	310	1,808	317	2,126	82		82	1,524		1,524
1978				1,571	548	2,119				1,807		1,807
1979				1,374	840	2,214				1,645		1,645
1980				1,735	290	2,025				1,190		1,190
1981				1,764	160	1,923				881		881
1982				1,924	171	2,095						

TABLE 5.4 (continued)

Year	JET FUEL REFINERY (Mosby)			KENCO (Wolf Point)			DIAMOND ASPHALT (Chinook)			OTHER REFINERIES[7]	
	Montana	Wyoming	Total[8]	Montana	North Dakota	Total	Montana	Canada	Total	Montana	Total[9]
1953	26		26							2,272	2,272
1954	175		175				74		74	2,161	2,161
1955	127		127				241		241	2,139	2,139
1956	113	18	131				215	33	249	1,828	1,828
1957	138	20	158				195	10	205	1,673	1,685
1958	121	5	127				202		202	1,299	1,299
1959	179		179				277		277	595	595
1960	116		116				218		218	595	595
1961	110		110				236	19	255	31	31
1962	51	37	92				186	22	207	373	373
1963	326	40	366				148		148	70	70
1964	57		57				95		95	41	41
1965	58		58				111		111		
1966	66		66				165		165		
1967	65		65				173		173		
1968	30		30				173		173		
1969	30		30				174		174		
1970	34		34				158		158		
1971	25		25				190		190		
1972	19		19				144		144		
1973	7		7				3		3		
1974											
1975											
1976											
1977				826	7	833					
1978				961	5	966					
1979				1,329	6	1,336					
1980				1,110		1,110					
1981				1,368		1,368				601	601
1982				1,272		1,272				1,368	1,368

r Revised.

[1] Formerly Carter Oil (1953-59) and Humble Oil (1960-72).

[2] Includes 9,000 barrels from South Dakota in 1954, 13,000 barrels from South Dakota in 1955, 17,000 barrels from North Dakota in 1980, and 14,000 barrels from North Dakota in 1981.

[3] Phillips Petroleum Company (1953-81) was purchased by Simmons in January 1982.

[4] Formerly the Texas-Calgary Company (1956-58) and Texstar Petroleum (1959-64).

[5] Union Oil Company (1953-70) was purchased by Flying J in mid 1981. Flying J receipts for the last half of 1981 and for the following years are reported under Other Refineries.

[6] Kenco refining reported separately beginning in 1977.

[7] Includes Modern Oil Company (1953-54), Texaco Incorporated (1953-60), Unity Petroleum Company (1957-58), PetroFuels Company (1961-64), North Star Refinery (1964), and Flying J (Cut Bank) (mid 1981-82).

[8] Includes 4,000 barrels from Canada in 1962.

[9] Includes 12,000 barrels to Unity Petroleum Company from Canada in 1957.

NOTE: The differences between the sums of component figures and the totals as reported are due to changes in refinery storage.

SOURCE: Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, *Annual Review,* 1953-82.

TABLE 5.5
TOTAL REFINERY RECEIPTS BY SOURCE OF CRUDE OIL, 1953-82
(thousand barrels)

	MONTANA		WYOMING		CANADA		NORTH DAKOTA		
Year	Crude Oil Refined in Montana	Percentage of Total	Crude Oil Refined in Montana	Percentage of Total	Crude Oil Refined in Montana	Percentage of Total	Crude Oil Refined in Montana	Percentage of Total	TOTAL[1]
1953	7,497	38.3	12,112	61.7	0	0.0			19,609
1954	9,034	45.4	10,865	54.5	0	0.0			19,909
1955	9,858	46.8	11,210	53.1	0	0.0			21,081
1956	9,053	39.6	13,720	60.0	88	0.4			22,861
1957	9,222	40.1	13,665	59.5	92	0.4			22,979
1958	9,165	39.4	14,089	60.5	12	0.1			23,265
1959	10,913	41.9	15,141	58.1	4	0.0			26,059
1960	10,531	42.3	14,383	57.7	21	0.1			24,935
1961	9,797	41.0	14,038	58.8	33	0.1			23,869
1962	11,175	39.7	16,708	59.4	266	0.9			28,149
1963	11,798	42.0	14,745	52.5	1,553	5.5			28,097
1964	12,292	38.4	15,714	49.1	4,002	12.5			32,007
1965	11,971	36.2	16,416	49.7	4,654	14.1			33,041
1966	10,626	31.8	18,120	54.2	4,684	14.0			33,429
1967	10,632	28.7	21,393	57.7	5,052	13.6			37,078
1968	9,690	23.7	20,915r	51.0	10,347r	25.2			40,951
1969	9,465	23.4	22,130r	54.7	8,843r	21.9			40,438
1970	9,080	21.5	19,342r	45.7	13,908r	32.8			42,330
1971	9,262	20.6	19,732r	43.8	16,003r	35.6			42,997
1972	8,194r	16.9	19,241r	39.6	21,156r	43.5			48,591r
1973	8,437r	16.6	18,235r	35.8	24,295r	47.7			50,967r
1974	7,989r	16.6	16,949r	35.3	23,115r	48.1			48,053
1975	8,002r	16.6	19,465r	40.4	20,690r	43.0			48,157r
1976	8,517	16.9	18,311	36.4	23,494	46.7			50,322
1977	8,928	18.5	18,248	37.8	20,921	43.3	200	0.4	48,297
1978	8,848	18.5	17,513	36.6	21,369	44.7	69	0.1	47,739
1979	8,668	17.1	18,368	36.3	23,578	46.6	6	0.0	50,620
1980	8,016	17.9	19,050	42.6	17,627	39.4	25	0.1	44,719
1981	8,691	22.4	18,298	47.2	11,797	30.4	14	0.0	38,801
1982	8,653r	20.5	18,178r	43.0	15,402	36.5			42,234

r Revised.

[1] Includes 9,000 barrels from South Dakota in 1954 and 13,000 barrels from South Dakota in 1955.

NOTE: Data originally reported by the Montana Oil and Gas Conservation Division have been revised on the basis of further information received from individual refineries. The Oil and Gas Conservation Division data originally understated Canadian inputs and overstated Wyoming inputs to the Continental Oil refinery, at least for the years 1968-75. Canadian inputs to the Big West Oil and Westco refineries were apparently not reported to the Oil and Gas Conservation Division. Revised data are available only for the years 1972-75, but it is likely that Canadian inputs to these two refineries were significant before 1972.

SOURCE: Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division, *Annual Review*, 1953-82.

TABLE 5.6
MOTOR FUEL USE, 1950-82
(thousand barrels)

Year	HIGHWAY USE OF MOTOR FUEL			Nonhighway Use of Motor Fuel	Losses Due to Evaporation, Handling, etc.	TOTAL CONSUMPTION OF MOTOR FUEL
	Gasoline	Diesel and LPG	Subtotal			
1950	4,027	181	4,208	1,262	83	5,553
1951	4,410	231	4,641	1,038	85	5,764
1952	4,482	295	4,777	1,370	92	6,239
1953	5,123	337	5,460	911	93	6,464
1954	4,870	405	5,275	1,401	96	6,772
1955	5,047	412	5,459	1,436	94	6,989
1956	5,569	421	5,990	1,271	103	7,364
1957	5,302	475	5,777	1,554	69	7,400
1958	5,703	513	6,216	1,193	70	7,479
1959	5,694	627	6,321	1,535	72	7,928
1960	5,772	648	6,420	1,666	75	8,161
1961	5,726	744	6,470	2,124	80	8,674
1962	6,525	722	7,247	986	87	8,320
1963	6,373	796	7,169	1,118	89	8,376
1964	6,504	840	7,344	1,016	86	8,446
1965	6,683	926	7,609	1,164	93	8,866
1966	7,063	1,030	8,093	970	90	9,153
1967	7,148	968	8,116	1,049	95	9,260
1968	7,654	1,089	8,743	967	96	9,806
1969	8,166	1,187	9,353	664	97	10,114
1970	8,397	1,384	9,781	944	101	10,826
1971	8,862	1,459	10,321	794	101	11,216
1972	9,393	1,646	11,039	1,004	104	12,147
1973	10,292	1,832	12,124	856	111	13,091
1974	9,810	1,737	11,547	758	106	12,411
1975	9,641	1,731	11,372	1,077	107	12,556
1976	10,693	2,073	12,765	1,099	119	13,983
1977	10,276	2,129	12,405	1,016	106	13,526
1978	12,170	2,389	14,559	908	124	15,591
1979	10,561	2,471	13,032	1,050	125	14,207
1980	9,917	2,348	12,265	971	111	13,347
1981	10,090	2,591	12,681	1,048	112	13,841
1982	9,678	2,639	12,317	961	105	13,384

NOTE: Motor fuel is defined as all gasoline covered by state motor fuel tax laws plus diesel fuel and LPG used in the propulsion of motor vehicles. Military use of motor fuel and all aviation fuel use are excluded in the Department of Transportation data. Figures for highway use of fuels may be understated because of refunds given on fuel for nonhighway use such as agriculture.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, annual reports, 1950-82.

TABLE 5.7
MONTHLY GASOHOL CONSUMPTION, 1980-83
(gallons)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1980	9,000	8,000	13,000	0	9,550	4,950	13,830	15,650	17,200	17,650	25,379	23,101	**157,310**
1981	21,750	13,250	19,060	5,000	10,900	7,600	16,900	51,309	57,188	30,959	92,216	147,461	**473,593**
1982	162,053	233,445	252,149	508,366	987,158	1,286,233	1,260,640	1,213,227	843,258	1,023,225	1,208,338	1,193,898	**10,171,990**
1983	925,192	1,218,833	1,080,162	1,012,969	1,115,090	1,237,774	1,492,288	952,150P	628,601P	642,050P	728,590P	212,290P	**11,245,989P**

P Preliminary.

NOTE: Commercial marketing of Montana-produced gasohol began in October 1981. Prior to that time, most of the gasohol in Montana was imported. Since late 1981, there has been very little interstate shipment of gasohol; therefore, the amount of gasohol produced in Montana should be closely approximated by these consumption figures.

SOURCE: Montana Department of Revenue, Motor Fuels Tax Division (1980-83).

TABLE 5.8
SALES[1] OF PETROLEUM PRODUCTS, 1950-82
(thousand barrels)

Year	Distillate Fuel Oil[2]	Residual Fuel Oil	Kerosene[3]	Liquefied Petroleum Gases[4]
1950	2,478	4,222	231	211
1951	2,851	4,958	267	275
1952	3,063	4,220	277	324
1953	3,553	3,276	252	402
1954	3,755	1,751	261	537
1955	3,980	1,692	215	537
1956	4,219	1,646	213	610
1957	4,209	1,554	201	661
1958	3,642	1,643	303	296
1959	4,474	2,006	544	811
1960	4,713	2,022	476	737
1961	4,589	2,533	359	856
1962	5,522	3,049	265	819
1963	5,400	2,836	348	765
1964	5,684	2,356	651	931
1965	5,041	1,195	248	926
1966	5,802	1,371	117	1,165
1967	3,459	1,189	860	1,585
1968	4,119	1,495	816	1,685
1969	4,669	1,524	656	1,690
1970	4,823	1,249	376	1,327
1971	5,101	1,236	362	1,403
1972	6,121	1,485	383	1,704
1973	6,924	1,705	405	1,502
1974	7,646	2,290	174	1,465
1975	7,459	2,186	126	1,370
1976	8,383	2,549	80	1,420
1977	8,141	2,414	94	1,370
1978	8,114	2,665	95	1,662
1979	7,774	4,188	17	861
1980	6,626	3,012	0	1,488
1981	6,486	2,519	26	951
1982	5,814	1,668	0	1,223

[1] For distillate fuel oil, residual fuel oil, and kerosene, this table might better be titled *deliveries* rather than *sales*

[2] Distillate fuel oil includes diesel fuel for both on- and off-highway use.

[3] Excludes kerosene-type jet fuel and includes kerosene used in lamps, tractors, cooking stoves, heating, etc

[4] Liquefied petroleum gases include ethane, propane, butane (including isobutane), and butane-propane mixtures

NOTE: Some petroleum products are stored in secondary facilities, so sales figures do not necessarily equal consumption of those products during the given time period

Because of the changes in reporting methods, estimation procedures, sample frames, and report definitions, the reader is cautioned against comparing the 1950-78 data with the 1979-82 data

For the details concerning the changes, the reader should consult the source publications.

SOURCES: Distillate Fuel Oil, Residual Fuel Oil, and Kerosene: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, various titles including *Shipments of Fuel Oil and Kerosine* and *Sales of Fuel Oil and Kerosine*, annual reports, 1950-75; U.S. Department of Energy, Energy Information Administration, *Sales of Fuel Oil and Kerosine*, annual reports, 1976-78 (EIA-0113); U.S. Department of Energy, Energy Information Administration, *Deliveries of Fuel Oil and Kerosene*, annual reports for 1979-80 (EIA-0113); U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, annual reports for 1981-82 (EIA-0340).

Liquefied Petroleum Gases: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, various titles including *Sales of Liquefied Petroleum Gases and Ethane* and *Shipments of Liquefied Petroleum Gases and Ethane*, annual reports, 1950-75; U.S. Department of Energy, Energy Information Administration, *Sales of Liquefied Petroleum Gases and Ethane*, annual reports, 1976-79 (EIA-0114); U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, annual reports for 1981-82 (EIA-0340) (The data for 1980 appear in the 1981 source.)

Kerosene also spelled "Kerosine" in some source documents

TABLE 5.9
SALES OF DISTILLATE FUEL OIL BY SECTOR, 1960-78
(thousand barrels)

Year	Heating	Industry	Electric Utility	Oil Company	Military	Railroads	OTHER		TOTAL
							Diesel[1]	Total	
1960	902	141	0	7	57	2,241	1,312	1,365	4,713
1961	1,132	125	0	9	29	1,880	1,288	1,414	4,589
1962	1,324	220	0	12	26	1,720	1,946	2,220	5,522
1963	1,307	213	0	47	41	1,701	1,868	2,088	5,400
1964	1,080	361	0	39	38	1,833	2,050	2,330	5,684
1965	1,096	210	0	15	17	1,632	2,026	2,067	5,041
1966	1,092	257	0	22	0	1,464	2,662	2,967	5,802
1967	829	99	0	2	11	1,362	NA	1,156	3,459
1968	1,045	114	0	10	16	1,270	1,423	1,664	4,119
1969	1,197	148	14	60	20	1,469	1,537	1,761	4,669
1970	1,011	144	0	14	26	1,623	1,808	2,005	4,823
1971	1,095	136	0	18	22	1,674	2,026	2,156	5,101
1972	1,219	774	9	40	43	1,808	1,988	2,228	6,121
1973	1,337	890	159	31	29	1,918	NA	2,560	6,924
1974	1,346	1,090	49	35	28	2,302	2,430	2,796	7,646
1975	1,425	1,236	59	38	35	1,999	2,305	2,667	7,459
1976	1,789	1,156	117	41	12	1,955	2,876	3,313	8,383
1977	1,892	895	79	37	10	1,825	3,005	3,403	8,141
1978	2,097	872	87	59	8	1,954	2,797	3,037	8,114

[1] Includes both on- and off-highway use

NOTE Some petroleum products are stored in secondary facilities, so sales figures do not necessarily equal consumption of those products during the given time period

SOURCE U S Department of the Interior, Bureau of Mines, Mineral Industry Surveys, various titles including *Shipments of Fuel Oil and Kerosine* and *Sales of Fuel Oil and Kerosine*, annual reports, 1960-75, U S Department of Energy, Energy Information Administration, *Sales of Fuel Oil and Kerosine*, annual reports, 1976-78 (EIA-0113)

TABLE 5.9A
DELIVERIES[1] OF DISTILLATE FUEL OIL BY SECTOR, 1979-82
(thousand barrels)

Year	Residential	Commercial	Industrial	Oil Company	Electric Utility	Farm	Military	Railroad	On-Highway	Off-Highway	All Other	TOTAL
1979	555	631	376	215	163	1,010	26	1,573	2,535	432	258	7,774
1980	374	302	240	152	94	769	24	1,841	2,315	384	131	6,626
1981	274	381	380	312	40	908	4	1,455	2,384	184	164	6,486
1982	353	184	271	101	0	839	2	1,402	2,473	153	36	5,814

In 1979 DOE changed the title of the source report for this table from *Sales of Fuel Oil and Kerosene* to *Deliveries of Fuel Oil and Kerosene* because it determined that the data better represented deliveries (amount supplied for use within the state) than sales (transfers for money or credit). The title of this table was altered to reflect this change

NOTE Because of the changes in reporting methods, estimation procedures, sampling frames, and report definitions, the reader is cautioned against comparing the 1950-78 data with the 1979-82 data

SOURCES U S Department of Energy, Energy Information Administration, *Deliveries of Fuel Oil and Kerosene*, annual reports for 1979-80 (EIA-0113), U S Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, annual reports for 1981-82 (EIA-0340)

TABLE 5.10
SALES OF RESIDUAL FUEL OIL BY SECTOR, 1960-78
(thousand barrels)

Year	Heating	Industry	Electric Utility	Oil Company	Military	Railroads	Other	TOTAL
1960	354	439	2	817	70	299	41	2,022
1961	465	649	0	756	151	455	57	2,533
1962	1,011	568	0	931	86	385	68	3,049
1963	879	652	3	807	11	396	88	2,836
1964	503	664	53	712	9	299	116	2,356
1965	504	65	0	257	0	313	56	1,195
1966	482	56	45	342	118	263	65	1,371
1967	419	48	6	296	102	228	90	1,189
1968	419	102	23	681	56	185	29	1,495
1969	226	232	105	683	54	179	45	1,524
1970	183	109	9	792	45	74	37	1,249
1971	177	225	0	732	45	40	17	1,236
1972	209	227	16	967	32	32	2	1,485
1973	208	243	71	1,112	16	28	27	1,705
1974	376	465	3	1,307	80	44	15	2,290
1975	429	543	0	1,022	127	38	27	2,186
1976	858	562	0	962	147	0	20	2,549
1977	672	666	76	787	137	0	76	2,414
1978	802	818	0	817	148	0	80	2,665

NOTE: Some petroleum products are stored in secondary facilities, so sales figures do not necessarily equal consumption of those products during the given time period

SOURCE: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, various titles including *Shipments of Fuel Oil and Kerosine* and *Sales of Fuel Oil and Kerosine*, annual reports, 1960-75; U.S. Department of Energy, Energy Information Administration, *Sales of Fuel Oil and Kerosine*, annual reports, 1976-78 (EIA-0113)

TABLE 5.10A
DELIVERIES[1] OF RESIDUAL FUEL OIL BY SECTOR, 1979-82
(thousand barrels)

Year	Commercial	Industrial	Oil Company	Military	Railroad	All Other	TOTAL
1979	8	3,215	875	8	2	80	4,188
1980	5	390	2,525	0	0	92	3,012
1981	0	462	1,996	0	0	61	2,519
1982	5	300	1,349	0	0	14	1,668

[1] In 1979 DOE changed the title of the source report for this table from *Sales of Fuel Oil and Kerosene* to *Deliveries of Fuel Oil and Kerosene* because it determined that the data better represented deliveries (amount supplied for use within the state) than sales (transfers for money or credit). The title of this table was altered to reflect this change

NOTE: Because of the changes in reporting methods, estimation procedures, sampling frames, and report definitions, the reader is cautioned against comparing the 1950-78 data with the 1979-82 data.

SOURCES: U.S. Department of Energy, Energy Information Administration, *Deliveries of Fuel Oil and Kerosene*, annual reports for 1979-80 (EIA-0113), U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, annual reports for 1981-82 (EIA-0340)

TABLE 5.11
SALES OF LIQUEFIED PETROLEUM GASES AND ETHANE BY USE,[1] 1960-78
(thousand barrels)

Year	Residential and Commercial Use	Internal Combustion Engine Use	Industrial Use	Miscellaneous Uses[2]	TOTAL
1960	596	125	16	0	737
1961	724	118	11	3	856
1962	659	132	27	1	819
1963	587	126	51	1	765
1964	771	102	58	0	931
1965	748	46	132	0	926
1966	891	65	209	0	1,165
1967	1,170	162	253	0	1,585
1968	1,257	188	240	0	1,685
1969	1,261	199	229	1	1,690
1970	1,044	99	179	5	1,327
1971	1,065	132	202	4	1,403
1972	1,287	199	211	7	1,704
1973	1,136	169	191	5	1,502
1974	1,207	139	119	0	1,465
1975	1,145	123	101	0	1,370
1976	1,168	114	138	0	1,420
1977	1,168	78	124	0	1,370
1978	1,502	77	59	24	1,662

[1] Excluding use in gasoline production

[2] Includes secondary recovery of petroleum, agricultural uses, and uses as synthetic natural gas feedstock

SOURCE U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, various titles including *Sales of Liquefied Petroleum Gases and Ethane* and *Shipments of Liquefied Petroleum Gases and Ethane*, annual reports, 1960-75. U.S. Department of Energy, Energy Information Administration, *Sales of Liquefied Petroleum Gases and Ethane*, annual reports, 1976-78 (EIA-0114)

TABLE 5.11A
SALES OF LIQUEFIED PETROLEUM GASES AND ETHANE BY END USE,[1] 1979-82
(thousand barrels)

Year	Residential and Commercial Use	Internal Combustion Engine Fuel	Chemical/Industrial[2]	Gas Utility	Other[3]	TOTAL
1979	712	33	w	33	w	861
1980	975	w	w	w	w	1,488
1981	592	78	45	139	96	951
1982	866	w	116	w	149	1,223

w Data withheld to avoid disclosing reports for individual companies. These reports are included in the totals

[1] Excluding use in gasoline production

[2] Including refinery fuel use

[3] Including secondary recovery of petroleum, farm uses, and use as a synthetic natural gas feedstock

NOTE Because of the changes in reporting methods, estimation procedures, sampling frames, and report definitions, the reader is cautioned against comparing the 1950-78 data with the 1979-82 data

SOURCES U.S. Department of Energy, Energy Information Administration, *Sales of Liquefied Petroleum Gases and Ethane*, annual report for 1979 (EIA-0114); U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual* annual reports for 1981-82 (EIA-0340)

The 1980 data appear in the 1981 source

TABLE 5.12
REFINERY RECEIPTS OF MONTANA CRUDE OIL BY STATE OF DESTINATION, 1973-80
(thousand barrels)

State of Destination	1973	1974	1975	1976	1977	1978	1979	1980
Colorado	793	573	256	82	222	532	89	74
Illinois	3,096	2,608	2,236	7,713	6,613	558	1,028	2,689
Indiana	13,720	14,435	10,907	7,422	5,741	10,634	4,324	7,115
Kansas	1,638	1,065	1,020	935	227	1,017	1,490	1,435
Michigan	0	0	0	0	224	0	139	0
Minnesota, Wisconsin	1,199	1,617	2,026	2,029	2,350	2,286	1,364	1,565
Missouri, Nebraska	0	80	654	1,268	1,080	190	166	13
North and South Dakota	1,065	1,374	1,304	1,285	1,229	1,261	1,245	957
Ohio	80	115	59	225	141	214	113	0
Oklahoma	0	50	0	0	0	0	0	0
Pennsylvania	346	360	769	368	314	361	385	292
Utah	0	0	784	0	0	0	0	270
Wyoming	654	361	498	26	748	1,503	1,460	551
Other States	0	0	0	1	8	2	0	80
TOTAL	**22,591**	**22,638**	**20,513**	**21,355**	**18,897**	**18,558**	**11,803**	**15,041**

NOTE: This is the last printing of this table. DOE discontinued collection of these data in 1980 because refineries had difficulty in reporting accurate data on the origin of crude oil that had moved long distances, especially by pipeline. Because crude oil is often resold and/or exchanged more than once during the time between production and delivery to the refinery, precise tracking of shipments is difficult.

The publication that replaced the source document, *Petroleum Supply Annual* (EIA-0340), shows refinery receipts of crude oil by Petroleum Administration for Defense (PAD) district and method of crude oil transportation (pipeline, tanker, etc.). Montana is in PAD district IV, which also includes Wyoming, Idaho, Utah, and Colorado, and, thus, it is not possible to separate Montana-specific data from the aggregate data.

SOURCES: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, *Crude Petroleum, Petroleum Products and Natural Gas Liquids,* annual reports, 1973-75; U.S. Department of Energy, Energy Information Administration, *Crude Petroleum, Petroleum Products and Natural Gas Liquids,* annual reports, 1976-80 (EIA-0108).

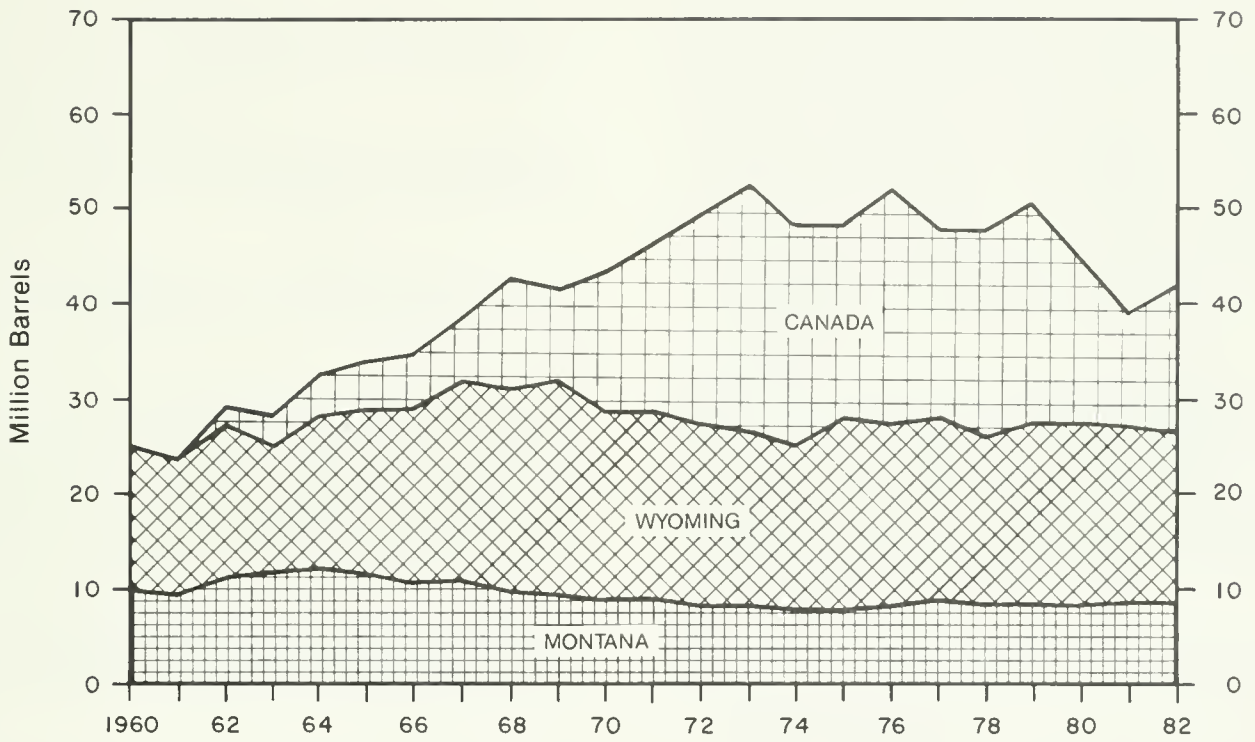


FIGURE 5.2 REFINERY RECEIPTS BY SOURCE OF CRUDE OIL, 1960-82

NOTE: Crude oil received from North and South Dakota is not shown due to its small volume.

SOURCE: Table 5.5.

Glossary

Average Megawatt: A unit of energy output over a specified time period. It is equivalent to the total energy in megawatt-hours divided by 8,760 (the number of hours in a year).

Average Mine Price: The ratio of the total value of the coal produced at the mine to the total production tonnage *(See* **F.O.B. Mine Price**).

Barrel: A volumetric unit of measure for crude oil and petroleum products equivalent to 42 U.S. gallons.

Bcf: One billion cubic feet.

Btu (British Thermal Unit): A standard unit for measuring the quantity of heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit (F).

Capacity: Amount of electric power delivered or required for which a generator, turbine, transformer, transmission circuit, station, or system is rated.

Coal: A black or brownish-black solid combustible substance formed by the partial decomposition of vegetable matter without free access to air and under the influence of moisture and, often, increased pressure and temperature. The rank of coal (anthracite, bituminous, subbituminous, and lignite) is determined by its heating value.

Anthracite: Hard and jet black with a high luster, it is the highest rank of coal and is mined in northeastern Pennsylvania (approximately 26.0 million Btu per ton).

Bituminous: The most common coal, it is soft, dense, and black with well-defined bands of bright and dull material. Bituminous is ranked between anthracite and subbituminous and is mined chiefly in Kentucky, Pennsylvania, and West Virginia (approximately 24.8 million Btu per ton).

Lignite: A brownish-black coal of the lowest rank; it is mined in North Dakota, **Montana,** and Texas (approximately 13.4 million Btu per ton).

Subbituminous: A dull black coal ranking between lignite and bituminous; it is mined chiefly in **Montana** and Wyoming (approximately 19.0 million Btu per ton).

Coal Bed: A bed or stratum of coal. Also called a **coal seam.**

Coal Rank: A classification of coal based on fixed carbon, volatile matter, and heating value. It is an indication of the progressive alteration, or coalification, from lignite to anthracite.

Demand: The rate at which electric energy is delivered to or by a system, part of a system, or piece of equipment at a given instant or averaged over any designated period of time. *(See* **Load**).

Demonstrated Reserve Base: A collective term for the sum of coal in both measured and indicated resource categories of reliability that represents 100 percent of the coal in these categories in-place as of a certain date. Includes beds of bituminous coal and anthracite 28 or more inches thick and beds of subbituminous coal 60 or more inches thick that occur at depths to 1,000 feet. Includes beds of lignite 60 or more inches thick that can be surface mined. Includes also thinner and/or deeper beds that presently are being mined or for which there is evidence that they could be mined commercially at this time. Represents that portion of the identified coal resource from which reserves are calculated.

Distillate Fuel Oil: A general classification for one of the petroleum fractions produced in conventional distillation operations. It is used primarily for space heating, on-and-off-highway diesel engine fuel (including railroad engine fuel and fuel for agricultural machinery), and electric power generation. Included are products known as No. 1, No.2 and No. 4 fuel oils; No. 1, No. 2, and No. 4 diesel fuel.

End-Use Sectors: Energy use is assigned to the major end-use sectors according to the following guidelines as closely as possible:

Residential sector: Energy consumed by private household establishments primarily for space heating, water heating, air conditioning, cooking, and clothes drying.

Commercial sector: Energy consumed by nonmanufacturing business establishments, including motels, restaurants, wholesale businesses, retail stores, laundries, and other service enterprises; by health, social, and educational institutions; and by federal, state, and local governments.

Industrial sector: Energy consumed by manufacturing, construction, mining, agriculture, fishing, and forestry establishments.

Transportation sector: Energy consumed to move people and commodities in both the public and private sectors, including military, railroad, vessel bunkering, and marine uses, as well as the pipeline transmission of natural gas.

Electric utility sector: Energy consumed by privately and publicly owned establishments that generate electricity primarily for resale.

Extraction Loss: The reduction in volume of natural gas resulting from the removal of natural gas liquid constituents at natural gas processing plants.

Feedstock: Natural gas used as a raw material for its nonfuel chemical properties in creating an end product.

F.O.B. Mine Price: The "free on board" mine price. This is the price paid for coal measured in dollars per short ton at the mining operation site and, therefore, does not include freight/shipping and insurance costs.

Fossil Fuel: Any naturally occurring fuel of an organic nature, such as coal, crude oil, and natural gas.

Fossil Fuel Plant: A plant using coal, oil, gas or other fossil fuel as its source of energy.

Fuel: Any substance that can be burned to produce heat; it sometimes includes materials that can be fissioned in a chain reaction to produce heat.

Gas Condensate Well: A gas well that produces from a gas reservoir containing considerable quantities of liquid hydrocarbons in the pentanes and heavier range generally described as "condensate."

Gas Well: A well that is completed for the production of gas from either nonassociated gas reservoirs or associated gas and oil reservoirs.

Gasohol: A blend of finished motor gasoline (leaded or unleaded) and alcohol (generally ethanol but sometimes methanol) in which 10 percent or more of the product is alcohol.

Generation (Electric): The act or process of producing electric energy from other forms of energy; also, the amount of electric energy produced, expressed in watt-hours (Wh).

Gross: The total amount of electric energy produced by the generating units in a generating station or stations, measured at the generator terminals.

Net: Gross generation less the electric energy consumed at the generating station for station use. (Energy required for pumping at pumped-storage plants is regarded as plant use and is subtracted from the gross generation and from hydroelectric generation.)

Gigawatt (GW): One billion watts.

Gigawatt-hour (GWh): One billion watt-hours.

Gross Withdrawals: Full well stream volume excluding condensate separated at the lease.

Horsepower: A unit of power equal to 746 watts.

Hydroelectric Power Plant: A plant in which the prime mover is a waterwheel driven by falling water.

Identified Resources: Coal deposits whose location, rank, quality, and quantity are known from geologic evidence supported by engineering measurements. Included are beds of bituminous coal and anthracite 14 or more inches thick and beds of subbituminous coal and lignite 30 or more inches thick that occur at depths to 6,000 feet. The existence and quantity of these beds have been delineated within specified degrees of geologic assurance as measured, indicated, or inferred. Also included are thinner and/or deeper beds that presently are being mined or for which there is evidence that they could be mined commercially.

Indicated Resources: Coal for which estimates of the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections. Indicated resources are computed partly from specified measurements and partly from projection of visible data for a reasonable distance on the basis of geologic evidence. The points of observation are ½ to 1½ miles apart. Indicated coal is projected to extend as a ½-mile-wide belt that lies more than ¼ mile from the outcrop or points of observation or measurement.

Inferred Resources: Coal in unexplored extensions of demonstrated resources for which estimates of the quality and size are based on geologic evidence and projection. Quantitative estimates are based largely on broad knowledge of the geologic character of the bed or region and where few measurements of bed thickness are available. The estimates are based primarily on an assumed continuation from demonstrated coal for which there is geologic evidence. The points of observation are 1½ to 6 miles apart. Inferred coal is projected to extend as a 2¼-mile-wide belt that lies more than ¾ mile from the outcrop or points of observation or measurement.

Installed Nameplate Capacity: The capacity as shown on the manufacturer's identification plate. This appears on apparatus, such as generating units, turbines, or other equipment in a station or system. Installed station capacity does not include auxiliary or house units. The nameplate capacity is the full-load continuous rating of a generator, prime mover, or other electrical equipment under specified conditions as designated by the manufacturer. It is usually indicated on a nameplate attached mechanically to the equipment.

Kerosene: A petroleum distillate that boils at a temperature between 300-550 degrees F, that has a flash point higher than 100 degrees F, that has a gravity range from 40-46 degrees API, and that has a burning point in the range of 150-175 degrees F. Included are the two classifications, No. 1-K and No. 2-K, and all grades of kerosene called range or stove oil which have properties similar to No. 1 fuel oil, but with a gravity of about 43 degrees API and a maximum endpoint of 625 degrees F. Kerosene is used in space heaters, cook stoves, and water heaters and is suitable for use as an illuminant when burned in wick lamps.

Kilowatt (Kw): One thousand watts.

Kilowatt-hour (kWh): One thousand watt-hours.

Lease Condensate: A natural gas liquid recovered from gas well gas (associated and nonassociated) in lease separators or natural gas field facilities. Lease condensate consists primarily of pentanes and heavier hydrocarbons.

Liquefied Natural Gas (LNG): Natural gas that has been liquefied by reducing its temperature to minus 260 degrees F at atmospheric pressure.

Liquefied Petroleum Gases (LPG): Propane, propylene, butanes, butylene, butane-propane mixtures, ethane-propane mixtures, and isobutane produced at refineries or natural gas processing plants, including plants that fractionate raw natural gas plant liquids.

Load (Electric): The amount of electric power delivered or required at any specific point or points on a system.

Marketed Production: Gross withdrawals less gas used for repressuring, quantities vented and flared, and nonhydrocarbon gases removed in treating or processing operations.

Mcf: One thousand cubic feet.

Measured Resources: Coal for which estimates of the rank, quality, and quantity have been computed, within a margin of error of less than 20 percent, from sample analyses and measurements from closely spaced and geologically well-known sample sites. Measured resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that the tonnage is judged to be accurate within 20 percent. Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coalbeds, the points of observation are no greater than ½ mile apart. Measured coal is projected to extend as a ¼-mile belt from the outcrop or points of observation or measurement.

Megawatt (MW): One million watts.

Megawatt-hour (MWh): One million watt-hours.

MMcf: One million cubic feet.

Natural Gas: A mixture of hydrocarbon compounds and small quantities of various nonhydrocarbons existing in the gaseous phase or in solution with crude oil in natural underground reservoirs at reservoir conditions. The principal hydrocarbons usually contained in the mixture are methane, ethane, propane, butane, and pentanes. Typical nonhydrocarbon gases that may be present in reservoir natural gas are carbon dioxide, helium, hydrogen sulfide, and nitrogen. Under reservoir conditions, natural gas and the liquefiable portions occur either in a single gaseous phase in the reservoir or in solution with crude oil, and are not distinguishable at the time as separate substances.

Natural Gas—Associated-Dissolved: The combined volume of natural gas that occurs in crude oil reservoirs either as free gas (associated) or as gas in solution with crude oil (dissolved).

Natural Gas—Dry: The actual or calculated volumes of natural gas that remain after the liquefiable hydrocarbon portion has been removed from the gas stream (i.e., gas after lease, field, and/or plant separation), and any volumes of nonhydrocarbon gases have been removed where they occur in sufficient quantity to render the gas unmarketable.

Natural Gas—Nonassociated: Natural gas not in contact with significant quantities of crude oil in a reservoir.

Natural Gas—Wet After Lease Separation: The volume of natural gas remaining after removal of lease condensate in lease and/or field separation facilities, if any, and after exclusion of nonhydrocarbon gases where they occur in sufficient quantity to render the gas unmarketable. Natural gas liquids may be recovered from volumes of natural gas, wet after lease separation, at natural gas processing plants.

Natural Gas Liquids: Those hydrocarbons in natural gas that are separated from the gas through the processes of absorption, condensation, adsorption, or other methods in gas processing or cycling plants. Generally, such liquids consist of propane and heavier hydrocarbons and are commonly referred to as condensate, natural gasoline, or liquefied petroleum gases. Where hydrocarbon components lighter than propane are recovered as liquids, these components are included with natural gas liquids.

Natural Gas Plant Liquids: Natural gas liquids recovered from natural gas in gas processing plants, and in some situations, from natural gas field facilities. Natural gas liquids extracted by fractionators are also included. These liquids are classified as follows: ethane, propane, ethane-propane mix, isobutane, butane, butane-propane mix, isopentane, natural gasoline, plant condensate, unfractionated stream, and other products from natural gas processing plants (i.e., products meeting the standards of finished petroleum products produced at natural gas processing plants, such as finished motor gasoline, finished aviation gasoline, special naphthas, kerosene, distillate fuel oil, and miscellaneous products).

Petroleum (Crude Oil): A naturally occurring, oily, flammable liquid composed principally of hydrocarbons, and occasionally found in springs or pools but usually obtained from beneath the earth's surface by drilling wells.

Petroleum Products: Petroleum products are obtained from the processing of crude oil (including lease condensate), natural gas, and other hydrocarbon compounds. Petroleum products include unfinished oils, natural gasoline and isopentane, plant condensate, unfractionated stream, liquefied petroleum gases, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, naphtha less than 400° F end-point, other oils over 400° F end-point, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products.

Petroleum Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and alcohol.

Proved Reserves of Crude Oil: Proved reserves of crude oil, as of December 31 of the report year, are the estimated quantities of all liquids defined as crude oil that geological and engineering data show with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.

Reservoirs are considered proved if economic producibility is supported by actual production or conclusive formation test (drill stem or wire line), or if economic producibility is supported by core analyses and/or electric or other log interpretations.

Proved Reserves of Natural Gas: Proved reserves of natural gas, as of December 31 of the report year, are the estimated quantities that analysis of geologic and engineering data show with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.

Reservoirs are considered proved if economic producibility is supported by actual production or conclusive formation test (drill stem or wire line), or if economic producibility is supported by core analyses and/or electric or other log interpretations.

Proved Reserves of Natural Gas Liquids: Proved reserves of natural gas liquids, as of December 31 of the report year, are those volumes of natural gas liquids (including lease condensate) that with reasonable certainty have been shown to be separable in the future from proved natural gas reserves under existing economic and operating conditions.

Recoverable Reserves: The amount of coal that can be recovered (mined) from the coal deposits at active, producing mines as of the end of the year.

Recovery Factor: The percentage of total tons of coal estimated to be recoverable from a given area in relation to the total tonnage estimated to be in the demonstrated reserve base. The estimated recovery factors for the demonstrated reserve base generally are 50 percent for underground mining methods and 80 percent for surface mining methods. More precise recovery factors can be computed by determining the total coal in place and the total amount of coal recoverable in any specific locale.

Recovery Percentage: The percentage of coal that can be recovered from the coal deposits at existing mines.

Reserve: That portion of the demonstrated reserve base that is estimated to be recoverable at the time of determination. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the demonstrated reserve base.

Residual Fuel Oil: The topped crude of refinery operation that includes No. 5 and No. 6 fuel oils, Navy Special fuel oil, and Bunker C fuel oil. Residual fuel oil is used for the production of electric power, space heating, vessel bunkering, and various industrial purposes. Includes imported crude oil to be burned as a fuel.

Short Ton: A unit of weight equal to 2,000 pounds. All tonnages used in this publication are in short tons.

Steam-Electric (Conventional) Plant: A plant in which the prime mover is a steam turbine. The steam used to drive the turbine is produced in a boiler by heat from burning fossil fuels. *(See* **Fossil Fuel** *and* **Fuel.**)

Surface Mine: A mine producing coal that is usually within a few hundred feet of the earth's surface. Overburden (earth above or around the coal) is removed to expose the coal bed. The bed is then mined using surface excavation equipment such as draglines, power shovels, bulldozers, loaders and augers. This type of mine may also be known as an **area, contour, open-pit, strip,** or **auger mine.**

Underground Mine: A mine producing coal by tunneling into the earth to the coal bed. The bed is then mined using underground mining equipment such as cutting machines and continuous longwall and shortwall mining machines. Underground mines are classified according to the type of opening used to reach the coal—i.e. **drift** (level tunnel), **slope** (inclined tunnel), or **shaft** (vertical tunnel).

Unit Value, Wellhead: Represents the wellhead sales price, including charges for natural gas plant liquids subsequently removed from the gas, gathering and compression charges, and state production, severance, and/or similar charges.

Watt: The electrical unit of power or rate of doing work. A watt is the rate of energy transfer equivalent to 1 ampere flowing under pressure of 1 volt at unity power factor (volt and ampere in phase). It is analogous to horsepower or foot-pound-per-minute of mechanical power. One horsepower is equivalent to approximately 746 watts.

Watt-hour (Wh): Equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour.

SOURCE: These definitions were compiled from the glossaries in the following U.S. Department of Energy, Energy Information Administration publications: *Coal Production* (EIA-0118), *Cost and Quality of Fuels for Electric Utility Plants* (EIA-0191), *Demonstrated Reserve Base of Coal in the United States on January 1, 1980* (EIA-0280), *Electric Power Annual* (EIA-0348), *Inventory of Power Plants in the United States* (EIA-0095), *Natural Gas Annual* (EIA-0131) and its predecessor publication, *Natural Gas Production and Consumption* (EIA-0131), *Petroleum Supply Monthly* (EIA-0109), and *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves* (EIA-0216).

The definition of average megawatt is from the Northwest Power Planning Council, *Northwest Conservation and Electric Power Plan,* volume 1, 1983.

ABBREVIATIONS

AGA	American Gas Association
bbl	Barrel
Bcf, bcf	Billion cubic feet
Btu	British thermal unit
DNRC	Montana Department of Natural Resources and Conservation
DOE	U.S. Department of Energy
DRB	Demonstrated reserve base
E	Estimated figure
EIA	U.S. Department of Energy, Energy Information Administration
FERC	Federal Energy Regulatory Commission
GW	Gigawatt
GWh	Gigawatt-hour
HES	*Montana Historical Energy Statistics*
kW	Kilowatt
kWh	Kilowatt-hour
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
Mcf, mcf	Thousand cubic feet
MDU	Montana-Dakota Utilities
MEC	Montana Energy Council
MLP	Montana Light and Power Company
MMcf	Million cubic feet
MPC	Montana Power Company
MW	Megawatt
MWh	Megawatt-hour
NA	Not available
NGL	Natural gas liquids
P	Preliminary figure
PPL	Pacific Power and Light Company
PSC	Montana Public Service Commission
psia	Pounds per square inch absolute
PSP&L	Puget Sound Power and Light Company
R, r	Revised
SIC	Standard Industrial Classification (code)
t	(Short) ton
TBtu	Trillion British thermal units
w	Withheld to avoid disclosure of individual company data
W	Watt
Wh	Watt-hour
WWP	Washington Water Power Company

ENERGY CONVERSION FACTORS

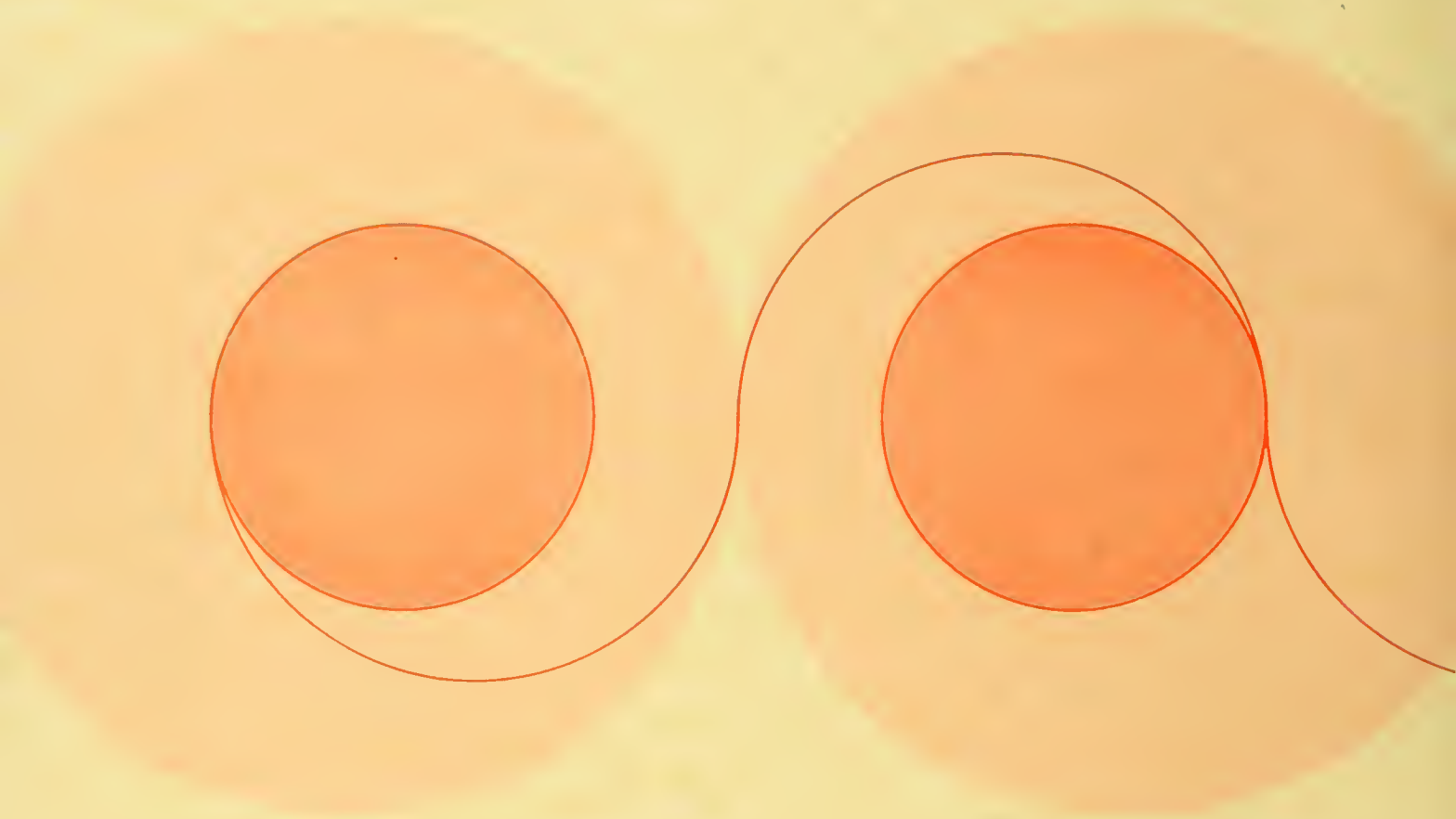
Fuel	Approximate Btu Content
Coal:	
Anthracite (U.S. average)	25,400,000 Btu/short ton
Bituminous (U.S. average)	23,650,000 Btu/short ton
Subbituminous (Montana)	17,500,000 Btu/short ton
Lignite (Montana)	13,000,000 Btu/short ton
(Dry) Natural gas	1,000 Btu/cubic foot
Crude oil	5,610,000 Btu/barrel
Refined petroleum products:	
Motor gasoline	5,250,000 Btu/barrel
Distillate fuel oil	5,830,000 Btu/barrel
Residual fuel oil	6,290,000 Btu/barrel
Kerosene	5,670,000 Btu/barrel
Liquefied petroleum gases (propane-butane mix)	4,011,000 Btu/barrel
Lubricants	6,070,000 Btu/barrel
All products (average)	5,520,000 Btu/barrel
Electricity	3,412 Btu/kilowatt-hour

NOTE: This table shows the conversion factors used by DNRC's Energy Division. The U.S. Department of Energy uses slightly different values for the approximate heat content of various fuels. These values are based, in part, on the average Btu value of fuels burned nationwide in a particular year. (For example, the moisture content of anthracite coal affects its heat content; DOE uses the average Btu value of anthracite burned in the United States in a given year as the approximate heat content of anthracite coal for that year.)

Extensive tables showing the approximate heat content of various fuels over the past ten years can be found inside the back cover of the U.S. Department of Energy, Energy Information Administration's publication, *Monthly Energy Review* (EIA-0035).

One Btu is approximately equal to the heat given off by one blue-tip match[1].

[1]SOURCE: U.S. Department of Energy, Assistant Secretary for Conservation and Solar Energy, Office of Buildings and Community Systems, *What About Fireplaces?*, publication 313 (DOE/TIC-11297).



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